

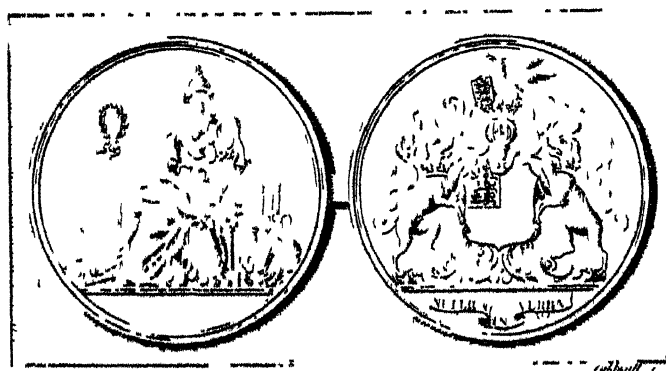


AGRICULTURAL RESEARCH INSTITUTE
PUSA

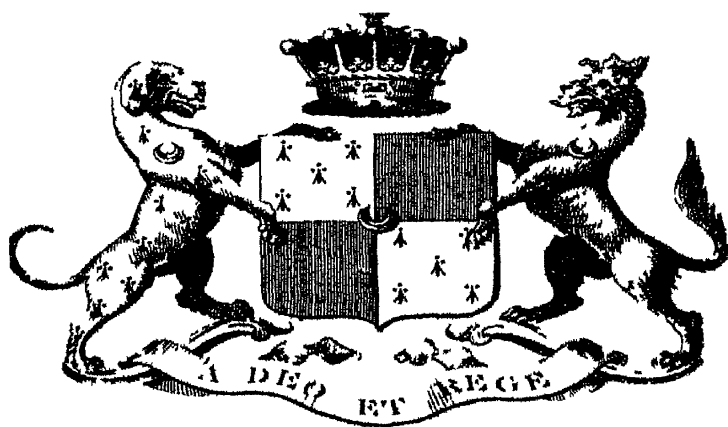
PHILOSOPHICAL
TRANSACTIONS,
OF THE
ROYAL SOCIETY
OF
L O N D O N.

VOL. LXXII. For the Year 1782.

P A R T I.



L O N D O N,
SOLD BY LOCKYER DAVIS, AND PETER ELMSLY,
PRINTERS TO THE ROYAL SOCIETY.
MDCCLXXXII.



PHILOSOPHICAL
TRANSACTIONS.

Giving some

ACCOUNT

OF THE

Present Undertakings, Studies and Labours

OF THE

INGENIOUS.

In many

Considerable Parts of the World.

VOL. XXV. For the Years 1706 and 1707.

L O N D O N,

Printed for B. Walford, Printer to the Royal Society, at
the Prince's Arms in St. Paul's Church-yard,
MDCCLVIII.

TO HIS
ROYAL HIGHNESS
THE
PRINCE,

This Twenty Fifth Volume
OF
Philosophical Transactions

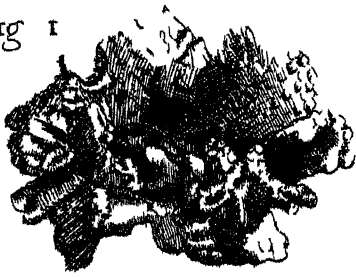
Is most humbly Dedicated,

BY
His Most Dutiful,
AND

Most Obedient Servant,

HANS SLOANE,
Soc. Reg. Secr.

Fig 1

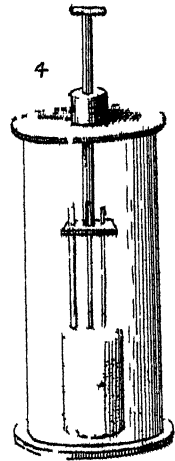


f 3



Aldebaran

f 4



f 2



PHILOSOPHICAL TRANSACTIONS.

For the Months of January, February, and March, 1705.

The CONTENTS.

- I. *A Letter from Mr Ralph Thoresby, F. R. S. to Dr Hans Sloane, R. S. Secr. concerning some Roman Inscriptions found at York, proving that the Ninth Legion sometime resided there.*
- II. *De Quadrupedibus Philippenſibus Tractat. a Reverendo Georg. Jos. Camel. transmissus Jacobo Petiver, Pharmacop. & Societ. Regiæ Soc. Londini.*
- III. *Microscopical Observations on the Seeds of several East-India Plants, by Mr Anthony van Leeuwenhoek, F. R. S.*
- IV. *A Letter from the Reverend Mr Mortou, A. M. and S. R. S. to Dr Hans Sloane, S. R. Secr. Containing a Relation of River and other Shells digg'd up, together with various Vegetable Bodies, in a Bituminous Marshy Earth, near Mears-Ashby in Northamptonshire: With some Reflections thereupon: As also an Account of the Progress he has made in the Natural History of Northamptonshire.*
- V. *An account of a very large Tumour in the fore-part of the Neck, in which was contain'd a Bony substance, Sec. By Dr James Douglas.*
- VI. *Part of a Letter from the Reverend Mr W. Derham, F. R. S. concerning a Glaze of Light observed in the Firmament.*
- VII. *An Account of an Experiment made before the Royal Society, touching the Proportion of the Weight of Air to the Weight of an equal Bulk of Water, without knowing the weight of either. By Mr Tun. Bunsen, F. R. S.*
- VIII. *An Experiment made in a Vacuum, shewing that the weight of spontaneous Ascent of Water, in small Tubes, now at both ends is the same in Vacuo as in the open Air. By Mr Fr. Hauksbee, F. R. S.*

- I. *A Letter from Mr Ralph Thoresby, F. R. S. to Dr Hans Sloane, R. S. Secr. concerning some Roman Inscriptions found at York, proving that the Ninth Legion some time resided there.*

BY your very kind Letter I perceive how much I am obliged to the Society for so candid a reception of my poor Endeavours, which encourages me to transmit two *Roman* Inscriptions found at *York*, one very lately, the other several years ago, but no where yet taken notice of, tho it hath this very remarkable, That it is an undeniable Argument that the *Ninth Legion* was not only in *Britain*, which is rarely taken notice of, but that it resided at *York*; which was heretofore unknown. It is a Funeral Monument, whereupon, under the Statue (in *Basse-relieve*) of the Standard-bearer of the 9th Legion, is this Inscription.

* Lubens voluit

Hic situs est.

L. DVCCIVS
* L. VOLT. RYFI
NVS. VIEN
SIGN. LEG. VIII.
AN. XXIX.
H. S. E.

This Monument was found at *Thimble* in the *Highgate* at *York*, and was happily recovered by my Honoured Friend *Dr Henry Prynne*, from the hands of a *Worshipman*, who

who had broke it in the middle, and were going to make use of it for two *Throughs*, as they call them, in the Wall; but by that worthy Gentlemans direction it was placed upright, with the Inscription outwards. That this 9th Legion was in *Britain* in *Galba's* time, and that it was also *Hispaniensis*, appears from the very Learned *Sir Henry Savile's* Notes at the end of his Edition of *Tacitus*; but that it, as well as the VIth and the XXth, was also called *Victrix*, or that it resided at *York*, has not been observed before; and yet both are evident from this Inscription upon a *Roman* Brick found there.

L E G. IX. VIC.

This is also an Argument of the Peace these Parts enjoyed at that time, (possibly the latter end of *Severus's* Reign,) making Bricks, casting up Highways, &c. being the usual employment of Souldiers at such vacancies. The former Inscription is now removed to the Gardens of *Sir John Goodricks* at *Ribston*; the latter is in my possession.

Sir Hen. Savile was of opinion that this *Nona Hispaniensis* in *Britannia* was one of those established by *Tiberius*, *Caesar*, or *Claudius*, or peradventure in the later times of *Augustus*; but however that it was certainly here in *Nero's* Reign, and that *Petrus Cerealis* was then Lieutenant thereof is indubitably evident from *Tacitus*, (*lib. 14. cap. 10.*) who gives a lamentable account of the slaughter of seventy thousand Citizens and Confederates, by the Emperor *Boudicca*, in which number was all the Foot of this ninth Legion: *Cerealis* with the Horse hardly escaping. It needless to add, that this Number is frequently by the *Romans* writ VIII as well as IX; for one that is but competently vers'd in their Coins or Inscriptions, cannot but have observed instances of both kinds; he never, to prevent all mistakes, (it being near ten

ten years since I saw this Monument) the Learned and Ingenious *Roger Gale*, Esq; was so kind as to send me a new Transcript; and I have by me also a third, lately taken by a grave Divine; all which agree that it is the IXth Legion, which is also confirm'd by the other Inscription upon the Brick, which was but lately found. I shall only add what an Ingenious Gentleman of *Oxford* writes, because it relates to an Author I have not the opportunity to consult here, but is possibly in your Curious Library. "I am mightily pleased with the Inscriptions
 "you sent me relating to the 9th Legion, there being
 "now no room to doubt about the place of Residence, a
 "thing which was unknown before; and for that reason,
 "those who have written about the *Roman* Legions have
 "said nothing about this, but leave us quite in the dark;
 "only *Ursatus* [in his Book *de Notis Rom.*] does remark,
 "that it must be somewhere in *Britain*, because *Tacitus*
 "tells us, that when the Colony at *Camalodunum* was de-
 "stroyed by *Boudicia*, *Petilius Cerealis*, Legate of the IXth
 "Legion, came to their assistance; but yet he makes no
 "mention of its being stiled *Viſſrix*. This I receiv'd
 from Mr *Tho. Hearne* of *Edmund Hall*, from whom is expected a curious Edition of *Livy*.

Your Most Obliged and Obedient Servant,

Ralph Thoresby.

II. *De Quadrupedibus Philippensibus Tractat. a Re-
verendo Georg. Jos. Camel. transmissus Jacobo
Petiver, Pharmacop. & Societ. Regiæ Soc. Lon-
dini.*

I. **C**ercopithecus *Luzonis* minimus. GAZOPHYL. GAZ NAT.
Natur. &c. Tab. 13. Fig. XI. T. 6 13 Fig

Magu vel Booot *Indorum*. Cercopithecus est *Luzonis* XI.
minimus. Magnitudinem quæ *Glyris* est, *Icon* exprimit, &
communiter adhuc minor, & gracilior est. *Facies* Leo-
nina; *Oculi* rubri, magni, rotundi ut *Noctua*, nunquam,
aut raro conniventes: *Aures* pellucidæ, depiles: *Pilus*
Murium luteolus, aut aureolus: *Gesticulationes* lepidæ ut
Simiæ: *Cauda*, & *Pedes* posteriores longitudinis reliqui
corporis: Raro interdum aparet, hinc cum cœcutire pu-
tant. Progreditur ordinariâ saltando, & retrorsum, vel
in obliquum velocius, quam antrosum. Narrant vivere
Carbone &c, sed falsum est, cum *Ficu Indica* & alijs ves-
catur *Fructibus*. Incedens cum prole, quam ad ventrem.
Plantæ volubilis *Pamago* tuniculis alligatam fugientem ge-
rit. *Pamago* verò *Indi* ad recidivas commendant.

2. Cato-Simius *volans* GAZOPH. NAT. Tab. 9. fig. 8
& Act. Philosoph. No 277. p. 1065. scu, S. B. 6. 1. GAZ NAT.
Tab 9 112.3.

Colago & *Cagwang* *Bysaniani*. *Gagua* *Pampangi* & *Taga-
li* vocant Cato-Simium volentem. Magnitudinis ordina-
riæ est *Felis*, formæ corporis *Simij*, sed gracilioris. A
Capite in *Caudam* trium *spithamarum longus*, ad *samora*
fesquispithamam latus, ad *brachia* duas *spithamas latus*,
à *pedibus* posterioribus, ad *pedes* anteriores trium *spitha-
marum*, à *pede* anteriori dextro ad *sinistram* trium pariter

spithamarum, à pede posteriori dextro ad finistram duarum spithamarum, Venter palmam latus, membranæ ad ventrem spithameæ. Verum invenitur ut affirmant in *Provincia Pampangi* magnitudinis, *Sinensis*, & portatilis umbraculi solis, seu latitudinis sex spithamarum. *Pilus* coloris subfulcè murini in dorso, quibusdam albis floccellis variegatus, suavissimus, qualis est *Pellis* Germanis *Ecce* vocata, in corpore longior, in membranis brevior: Ad *ventrem* longior, & ex albo rufescens, in membranis verò brevior, ejusdem coloris rara, & mollis lanugo. A capite ad brachia à brachijs ad pedes, à pedibus ad caudam usque latæ expanduntur membranæ, quibus expansis gravi volatu, non nisi ex summo unius arboris, in alterius caudicis medium transfertur, ubi dein volatu interpolari saltuatim summum petit. *Faciem* habet *Simiæ*, aures rotundas planas, pilis carentes, in quovis pedum anteriorum & posteriorum quinos compressos, Leoninos & acutissimè hamatos ungues. *Pellis* quam transmittit *Muris* erat, *Fæmella* ad Venterem binos habet quavis sacculos, in quibus catuli ubera fugientes hærent. Quibus vescatur ignotum, probabile est fructibus vivere, cùm communiter in arboribus degat.

3. Cabug vel Panicui. *Vespertilio* est magnitudinis *Galinae*, vespus. Orgyæ unius ab explicato alæ fine ad alterum invenit, *Petrus de S. Buenaventura*.

4. Cabugcabug s. Cabag vel Talibata. *Vespertilio* est parvus, ordinarius.

5. Colalapnit s. Calapnit. *Vespertilio* est communis, sed cristatus & duplicatis auribus.

6. Cornu *Rhinocerotis*, Hispan. Cuerno de Abada, *Unicornio*, & *Licornio*, Indis *Sinis* Sayguka. Affertur de *Siam* & *India*, majus & repandum seu recurvum, ex nare affervo albidum, cubitale ad inum spithamæ latum, ad medium diametri sesquispithamæ, solidum & ponderosissimum. *Alia* parva & *Sina* affertuntur quæ sunt ex dorsi gibbo. *Anulus* ex Cornu, & *ungula* contra aeris

commendant contagium, ut illos ex cruda *Tesludini*, *Marinae*, & *Dumbiga*, *Nu m Tannam* & *As n fatidum*, Ungulam, Sanguinem & Pulverem ad Febres *Acuta* & *Epi*. *Musiam* laudant.

7. *Bubalus Luzon*. *Indis* *Avang*, *Sins* *fuygo* i e. *Vacca* *aquatica Hispan*. *Carabao*.

Vox tenuis, quā potius balat, quam mugit : *Pilus* paucus, rarus, brevis, cinereo-terreus : *Corpus Buffalo Ungarico* compar : *Cornua* ingentia, non teretia, sed subplana, undatim aspera, coloris nativi, lateratim expansa, quandoq; ab extremo unius ad alterius sesquiorgyialia : *Cauda* brevis & forē depilis : *Domesticus* & *Sylvester*, qui ferocissimus magis nigricans & pilosus. *Carne* vescuntur utriusque *Sinae*, *Indi*, *Aethiopes*. *Calidissimum* est *Animal*, temporis plus sub aqua, aut luto sepultum jacere gaudens, quam subdio vagari. *Inimicitia* gerit *Crocodilo* quem non formidat. *Cinera Cornuum* Sp. *Vino* subactō, utuntur *Indi* pro contrectatione spasmo correptorum.

8. *Gadia* s. *Garia*. *Elephas*. Abundat ijs *Insula* *Iolō*.

9. *Amo*, *Cercopithecus barbati*, *Hispan*. *Sambor*. Magnitudine *Pueri* decennis, *Indis* resistentes. *Puellas* & *Indas* adultas infestantes. *Visus* est *Mindanae* duobus pedibus insistent *Homine* altior.

10. *Baculao*. *Cercopithecus* Magnitudinis *Canis*,

11. *Mananir*. *Cercopithecus* Magnus, *Canibus* resistens.

12. *Mufang*, *Dinirisan*, *Dingalong* & *Singarong* est *Catus Zibethinus*. Non gerit *Zibethum* in *Vesicula* conclusum ut *J. Schroder*, asserit, sed in concavitate, aut rima medium duarum viarum occupante. Ultra siq; una vice nunquam eximitur, si bene curetur, a maturis *Palantinis* & *Piscibus* abundanter saginetur, quavis tertia die si *Zibethi* dare solet. Verū hujates *Indi* labori supersedentes, *Catos* decipulis captos communiter interrimunt, ut *Zibethum* colligant. *Zibethum* rancidam aut corruptum *Succo Limoniorum* & *Sale* lotum, soliq; expositum, restipuitur. Invenitur in *Cato Zibethino* species *Lapidia* *Bexar*. *Zibethum* *Daris* vocant.

Luchana majores. Ex *Cercopitbecis* nitidè perpoliti sunt, magis compacti, lapidei, & ponderosi quam sint *Caprea-* rum; certantes ex laminulis, subamari, coloris cinereè, vel viridifusculi, vel fusce virentis, ex his dein emeram 323. Unciam 2 *Imperialibus* erant autem No 33. Magnitudinis cvi *Gallinacei* 4. Ovo *Columbino* majores 6. Ovo *Columb.* pares 4. *Oliva* supbares 5. *Oliva* minores 11. Tectes pollicem crassi, biunciam & sesquiunciam longi 3. Horum 3i. *Macai* venditur 6 *Imperial.* *Goæ* 3 *Imper.* & dimidio. *Mellapori* 7 vel 8 *Imp.* quorum 6 s. 7 unam pendet 3. Fragmentorum vero 3 *Imperial* 2. De reliquo pro magnitudine crescit *Æstimatio* & *Pretium*.

36. *Mexicani* & *Luzonici* coloris sunt dilutè terrei, & saporis nullius vix alicujus in Medicina effectus boni; Et hos *Officina* Occidentales vocant.

37. *Peruviani*, Coloris sunt ex viridi nigricantis, & hos *Orientalis* vocant.

38. *Indi* & *Mauritani* *Lapides Bezoarticos* generari narrant ex repletionè & pabuli indigestione. Et sane factibile est, ut ex indigestione multum tenacis ac viscosæ procreetur mucilaginis, & superveniente Sanguinis effervescentiâ, prædicta mucago violenter decocta, non solum magis ac magis glutinosa evadat, incrassetur ac inspissetur, sed & accidente aliquo sale petrificante & insolubilibus ac indigestibilibus (ut sunt Fructuum ossicula, Lapilli, Lignorum Fragmenta, argillacea, fibrorum, herbarum, radicum corticum tormentum) implicata, impacta ac superinducta in *Lapides* usque indurascendo abeat. Nec improbabile, tunc malè affectis, Animalia ex instinctu naturali, plantas depascere amaras, & una cum his *Contrayervam* & similia *Alexipharmica*, ita ut ex horum succo, tenaci illa viscositati commixto, *Lapidi Bezoartico* resultet, color subviridis, sapor amaricans & virtus *Alexipharmica*. Hinc *Lapides* ii qui in Animalibus Tabè consumptis, aut ut ferunt repletionè extinctis reperiuntur, plerumq; majores, aut si parvi numerosi sunt, nec non ceteris efficaciores censuntur. Ita

Ita in Provincia sonora Mexici, in Cervo emortuo *Lucas Valentinus* Lapidem invenit 3v pendentem, qui 530 Imper. æstiniatus fuit.

39. In *Jucatan*, Hispanus in Cervo tabe consumpto invenit 60 lapides, termè omnes æquales, magnitudinis *Nucis Avellanae*. In Lapidibus confractis, Golcondanis ex *Capris* & *Cercopithecis* inveni: Ex tomentosis filamentis compactum globulum, odoris suavis, subruffum fibroso-tomentosum globum, saporis aciduli; Pulveri impactas Radicum fibrillas. Oblonga Lignorum, Corticum & fructuum aut foliorum pediculorum frustella. Lapidès nigros, rufos, cinereos, duros & friabiles. Terræ argillaceæ rubentis & nativæ fragmina. Semen ni fallor Viticis. Semen trifore magnitudine *Ciceris* nucleo-putrente acido. Nucleum ossis *Tamarindorum* potiore. Os ferme unciale, nucleo *Dactylorum* simile, unifore, oleo scatens, in aliis pulveres variorum.

40. *Valesius* ab *Arziniega*, *Bezohar* vocat legitimos in animalium ventriculis (*Hisp.* Tripon, *Quaxo* & *Buche*) inventos. 2 *Lachrymas Cervi*. 3. *Fistulos*, quos necdum vidi præter *Nichalao Manuchianos*, formæ variæ quos fragmentis componit, includendo integrum minorem, sed facile distinguuntur, quia non sunt laminulati. Alios idem componit globosos, sigillatos, ex variis Cordialibus & *Cordiales* vocat. Alii deferuntur *Goâ*, ovales *Gaspar Antoniani*, pariter ex variis rebus compilati. An Lapidès de *Goa* *Georgivi Batai*? Illi verò an ejusdem *Batai* Lapidès *Contrayerva*.

41. *Hystrix*, Indis *Balatnamatinic*. Reperiitur in Provincia *Caraga* magnitudinis *Porcelli octomestri*. Ex hac eximitur *Lapis Porcinus*, seu *Hystericus* *Malacensis*, *Hisp.* *Pieda de Puerco Spin.* *Ægagropilus* potius quam *Lapis* dicendus, constat enim ex tomento, fibrillis & materia friabili, subruffa aspericante & de foris quibusdam in partibus, cutaceis & subnigris quasi unguibus coopertis, ut in tribus quos vidi observavi. Nec laminulatus, tunicatus neq; ponderosus, aut politus est ut *Bezohar*, sed levis & asperiusculus ut *Ægagropila*.

42. *Lapidem Hystericum Malacensem* vidi dein alium, ponderis 3v. emptum 150 *Imperial.* apretiatum vero 500 *Imper.* Orbicularis erat, læviusculus, coloris *Carneoli* pallescentis, quasi pellucidus, substantiæ solubilis, ad tactum linguæ mox acriusculè & summe amaricans. Hic *legitimus* esse videtur, de quibus (ut supra) Anno tibi scripsi elapso, aut adulterini aut *Ægagropilæ*.

43. *Hyana* Luzonis non odorata, seu *Leytensium* *Sarimao*, *Animal* est Putorio compar, & majus, sed dentibus instructum validissimis, longioribus & aduncis: His & unguibus *Apri*, aut *Damulæ* dorso sese tenacissime affigit, ibidemq; pertinaciter persistit, donec usq; *Aper* cursu lassatus, & doloris molestia defatigatus succumbat & pereat, & tunc vorat ad saturitatem. Dentes *Sarimao* quandoq; in *Apri* aut *Damulæ* dorso defixa reperiuntur, scilicet cum fortuito casu *Sarimao* relictis dentibus excutitur. Hos *Indi* superstitiose æstimare solent.

44. Lac vig *Bokolanorum*. Speciem esse referunt *Lupi* ferocis, magnitudinis *Vituli*, Hominiibus & Animalibus infestis. An Coyoile *Mexicanorum*.

45. *Mustela Hisp.* Comadreja *German.* Wiesel.

46. *Mustela* sylvest. *Viverra*, s. *Furunculus*. *Hisp.* *Huron*. *Germ.* *Hamester*.

47. Putorius. *Hisp.* Guardunna. *Germ.* Istesel.

48. Mures quos in *Insula Mindoro* ex arborum comprescentibus foliis oriri ferunt, affirmant qui curiosè investigavere, non ex arborum foliis, sed ex *Arundinis velatoris* speciej, fructibus generari.

49. Alamid T. Lamiran P. Miro s. Milo *Bys* Cacomittle *Mex.* Species est *Martis*, coloris minùs fulvi quam sit *Europææ*, magnitudinis *Felis*, Os productum, Pedes breves, Cauda *Cati Zibetini* bujatis, sed longior. Vescitur, *Insectis*, *Muribus*, *Avibus*, quas intuitu examinare ferunt, *Gallinis*, *Fructibus* & *Pane*. Facile Cicur evadit, vorax est & inquietissimum.

III. *Microscopical Observations on the Seeds of several East-India Plants, by Mr Anthony van Leeuwenhoek, F. R. S.*

Delft in Holland, March 19. 1706.

To the Honourable the Members of the
Royal Society in London.

Honourable Gentlemen,

I Now take the Liberty of communicating to you these my following Observations——A certain ancient Surgeon, that is a great Collector of Foreign Curiosities, had entreated another Surgeon, for whom he had an esteem, that when he was in the *East Indies*, and discover'd in the Plants or Seeds of those Parts any particular operation or effect, that he would impart some of 'em to him, with an account of their said operation; whereupon he had received from the *East Indies* the Seed of a Tree called *Eumane*, of which the Description and Operation is as follows——'Tis a Tree much about the bigness of an Elder Tree, and the Flower, the Scent and Figure of it is not very different, but the Branches are armed with Thorns——'Tis used inwardly by no body, excepting some Women, that, disagreeing with their Husbands, make use of it in order to kill themselves; it being consequently a certain Poyson——When these Women have made such a Heathenish and Treasonous Resolution, they take half a handful of those Leaves, boyling them

them in Water, and rubbing in a certain Oyl which they call *Sinfelen*, and so drink or eat it up; half an hour after which they perceive a kind of Convulsion in their Head, and vomit or retch four or five times: Lastly, they lose their Sences, and foaming at the Mouth, they fret and speak like Fools or Mad men till they dye: So that it seems that the Poyson thickens the Humours or fluid parts of the Body, till the circulation of them quite ceases. Some end their lives in one, others in two or three days, according as they have taken more or less of those Leafs. So far proceeded the Description that the *East India* Surgeon gave of it.——The above-mention'd Seed is mostly of a Triangular figure, and not above the breadth of $\frac{1}{2}$ of an inch where it is largest; I took a little of it and put into a clean Paper and bruised it with a Hammer, and after that into a little Glass Viol, and poured some fair Rain Water upon it, till the Water stood half an inch above the Seed.——After the Seed had been infused in the said Water some hours, I took a little of the Water and mixed it with my Blood, as it dropt from my Finger by the pricking of a Needle, and I immediately observed that the Blood was extremely Coagulated, yea, more than I had ever seen it in my Life.——But as Blood, when 'tis mixed with common Water, keeps its clear Red Colour, and a great many Globules, which are the cause of its redness, being dissolved in the Water, do so incorporate themselves therewith that you can distinguish none of them from the Water itself, which thereby acquires a fine Crimson Colour; the appearance was quite otherwise with the Blood that was mixed with the Seed Water, for the Particles or Globules thereof being Coagulated, did assume a Blackish or Dirty Colour; and so I observed a very great number of Blood Globules that were not Coagulated, they all lay like stiff Particles; neither could I perceive that one of them were dissolved, or united to the Water; so that not the least
red-

redness that looked like Blood was communicated to the Water, neither did there break forth the least Air bubble out of that mingled Liquor——I took moreover a little of the said Water, that was inclinable to a reddish colour, and dropt some of it upon six several places of a Glass Plate, in order to observe what Salt Particles might be Coagulated in the exhaled Liquor——I observed in the said Liquor, most of which did evaporate, that besides the Salt Particles there remain'd a great deal of a Coagulated Matter, in which I could discover no figure. I perceived likewise abundance of exceeding small Salt Particles, which were mostly of an exact square figure, and some few were long squares, with four Right Angles; some of those Salt Particles were broad in the middle, and pointed at both ends; but where a great many of them were Coagulated together, their figures were irregular——I observed likewise, that where the Water had lain a little time together, it was not altogether exhaled, but left a Balsamous Matter behind it——I put some of the said Seed into Water, in order to soften the Skin of it, that I might Dissect it the easier; and having accordingly open'd several of them, I took out the Plant, in which, tho it was no bigger than a small grain of Sand, I could perceive two Leaves, and that part of it which was to be the Root and Body——It was moreover affirmed, that the Oyl of *Singelan* or *Singely*, is esteem'd a good softner, and given to lying-in Women, and other persons that are in pain, as also to Children, with or without other Ingredients.

The Seed, of which also I had a little, is about the bigness of the aforementioned Seed, but something longer——I had moreover some few Seeds named *Cassie*, of which this is the Description——This Seed is used by the *Mahometans*; being ground small and infused in Water, which will make them as drunk as Wine does others: If a person that is not us'd to it should take but

10 or 20 grains, 'twould have the same effect as if they had drank 10 Bottles of Wine.

They say it makes them very stout and luxurious, but those that use it daily and too often, do bring themselves at last to 1 or 2 ounces; but then it will not have that effect, but rather the quite contrary, rendering them dull and doting, depriving them of their Memory together with the Appetite, and at last making them so lean, that they would have hardly any Flesh upon their Bones; and this is the use the *Moorish* Kings make of it, when they have a mind to be rid of their great Lords, whom they would make dye a lingering Death, they cause such a Drink to be made, into which they infuse also the Seeds of Poppies, and give it them twice a day to drink in the Prison, more or less, according as they have a mind to dispatch them sooner or later; insomuch that they shall live half a year or a whole year without knowing any thing of the matter. They call this Drink *Dosta*.

This Seed is little used by them in Physick, tho I doubt not that it might be excellently well apply'd, because it does not only imitate the effects of *Opium*, but also, if there be not too much of it us'd at a time, it has the same operation as the best Wine: So much for the Description of this Seed called *Cancie* — This Seed is about the bigness of Hempseed, and has likewise such a hard Skin, so that one would be apt to take it for it — I took some of the last mention'd Seeds and stripped the hard Skins from them, and after that the thin Membrane that covers the Plant, and observed that the Matter which lay within was, as it appeared to me, nothing else but two Leafs and the Root and Body of a Plant; but when I separated those two Leafs, I found that they involved two other very small Leafs, long and slender, and of the figure of the former; and I also discover'd that these small Leafs had each of them four or five small ones standing out above one another, from whence
I con-

I concluded that the Tree or Plant which produces these Leaves is notched or indented.-----Afterwards I took some of the Hempseed, which I thought I had well Dissected, and of which, if my Memory fails me not, I have formerly given a Description to the Royal Society; and examin'd the said Seed anew, to try whether I could discover any such small Leafs as I have found before in the Seed *Cancie*.-----Having then Dissected this our common Hempseed, I found that all the parts of it agreed with that of the abovemention'd Seed; at first indeed when I took the small Leafs out of the larger in which they were folded, I could not see those Indented Parts abovemention'd, but when I separated the Leafs from each other, I could easily perceive them; and then appear'd the two exceeding long Leafs lying so regularly within one another, that the Indented parts could not be discover'd.-----I bruised a few of these little *Cancie* Seeds, and pour'd Rain Water upon them, in order to discover whether there were any Salt Particles in the same, and tho I let some of the drops of this Water stand several days together, it did not at all evaporate, but there remain'd behind a thick moist Oily Matter, which I suppose was the cause that I could discover so few Salts to be Coagulated, and those that were there, that are hardly worth naming, were of the figure of those that are found in Wine Vinegar.

IV. *A Letter from the Reverend Mr Morton, A. M. and S. R. S. to Dr Hans Sloane, S. R. Secr. Containing a Relation of River and other Shells digg'd up, together with various Vegetable Bodies, in a Bituminous Marshy Earth, near Mears-Ashby in Northamptonshire: With some Reflections thereupon: As also an Account of the Progress he has made in the Natural History of Northamptonshire.*

IN obedience to your Commands, I send you the Account of the Land, and River Shells lately discover'd by the Worthy and Inquisitive Mr Coxo of *Mears-Ashby* in *Northamptonshire*, in a Moorish Pasture in *Mears-Ashby* Field. I visited the place my self, he very generously attending and assisting me. I know the Relation will be the more acceptable to you, and 'tis indeed of greater Regard, because Land and River Shells are so very rarely met with in Digging into the Earth, in comparison of Sea Shells, and the Teeth and Bones of Marine Animals; which indeed occur almost every where, and in all Countries. The Reason of which is now no longer a Difficulty, these Bodies having been shewn to be all Remains of the Universal Deluge; and the Marine Shells being more ponderous than those of the Land and Rivers, sunk and were lodg'd deeper in the Earth, and so were preserv'd by that means; whereas the later being left generally

nerally upon the Surface, perish'd, and are at this day rarely met with.

Causing one to dig into the Moorish Ground above-mentioned, we found a small number of Snail Shells of various kinds buried there. At about a foot in depth they lay very thick; and sinking still downwards the number rather encreased till we came to the depth of about three foot. 'Twas troublesome to sink deeper on purpose; but we made Tryals for a considerable extent of Ground, viz. about 250 foot in length, and 130 in breadth. Besides, the same Shells were cast up in several places, at distance, by Moles. What we principally observed in this search was 1. A moist Moorish black Earth, in some places a foot and a half, in others somewhat above two foot in thickness. The lower half of it is blacker and denser than the upper half, of a Bituminous Nature, and has all the Characters of Peat-Earth. Besides Shells we found Stalks and Leaves of Grass, and also of many Kinds of other Vegetables reposed as usual in like Bituminous Moors, in other parts of this Island. 2. White Earth; so at first we call'd it: But upon closer Inspection it appear'd to be little more than Hay half wasted. So deep as we sunk into it, we found it every where copiously interspers'd with Shells.

The finding these Shells Under Ground made it very reasonable to enquire whether there were any of the like at this time living upon the surface. I diligently search'd this place, but cou'd not meet with any Live ones of any Kind whatever there.

The Fossil Shells were some the *Exuvie* of Land-Snails, the rest of River or Fresh Water-Snails: Of the former there were the three following kinds. 1. A small *Buccinum* of five wreaths, the *Buccinum exiguum quinque anfractuum*, Tit. 7. List. in *Traictat. de Cochleis Terrestr. Angl.* A Kind observ'd by Dr Lister to live in Moss upon old Garden

Garden Walls or *Esdrope* in *Lincolnshire*; by my self, at the Moss, Roots of Old Trees in many of the *Northamptonshire Woods*, as also amongst Moss upon the Boggy sides of several standing Springs.

2. A *Cochlea* of the compressed Kind, but not so much compressed as most of them are. It has five Wreaths and a small circular *Sinus* in the Center. This, if it is not the *Cochlea umbilicata* etc. N 79. *List. Hist. Conchyl. Lib. 1.* has not hitherto been mention'd by any Writer; tho' common enough in the Woods in *Northamptonshire*: I found a greater Number of them, for the Compass of Ground, inclos'd in the Earth, than ever I have done in any of the Places where they naturally breed.

3. The *Cochlea citrina* Tit. 3. *List. de Coch. Terrest. Ang.* The Common Strip'd Snail-shell. But most of these in the Moor are White, of the Colour of the Shells that have been a long time dead. In some I saw faint footsteps of their former Stripes. Most of the Shells of this Kind were lodg'd about 4 foot deep.

We met with only two different Kinds of River-Shells.

1. A Perewinkle Shell of three Wreaths, generally less than the *Buccinum trium Spirar.* Tit. 24. *List. de Coch. Fluvial. Ang.* There were a greater Number of these buried in the Moor than of any of the former Kinds.

2. A Perewinkle Shell of five Wreaths, much smaller and more prominent than those of the *Buccinum longum sex Spirarum* Tit. 21. *List. de Coch. Fluvial.* 'Tis otherwise very like that *Buccinum* in the fashion of its Wreaths. It has not yet been describ'd by any Author. We find the Kind now living in one of the *Northamptonshire Brooks* call'd the *Isle*.

The Moorish Ground wherein these Shells were buried extends from near the top to very near the foot of a small Hill. Above the Moor, upon the Top, and at the Brow of the Hill, is a Sandy Soil of a Reddish Colour. The whole

whole face of the Moor is plain and even, conform ble
to the surface of the water & none of the
irregularities which are to be seen in a
moor that has been raised by the sea. The
soil is a deep red, and is composed of
the same materials as the soil of the
sea.

The earth is not so hard as it is
when those from Sea were also deposited
not buried since by Deterrations now. He C
For then the upper parts of the Moor
cover'd with a Reddish Sand, such as the
the main compos'd of; but nothing like
the Shells in this Moor. Besides, here
Shells that in all likelyhood never
Inhabitants of a different Soil: Particularly the
Snail Shell. For these Animals have peculiar
affect particular Regions.

But what I here have said will
in a much better light when read and
Persons, in the Natural History of
You are very kind in your Enquiries about
of that Work; and very many of my Friends in this
Country have been pressing in their Solicitations to have
it at an end. I am mighty sensible of their Good Wishes
both to me, and to that Undertaking, and hope all
were are now well satisfied it goes on as fast as is practi-
cable. I have indeed exceeded the time I at first pro-
posed; but this is owing to the Growing of Mat-
ter upon my Hands, and the Difficulty of treating
in a manner that was fit, and would render the Work
useful. Those who have well weigh'd this, have me
very frankly to my own Time: And I will do my best
to acquit my self of the Task with such Dispatch, that
they shall have no Cause to think their Indulgence and
Generosity misplead. I have gone through the several
Heads of the Heavens and Air, the Waters, the Earths,

the Stones, the Sea Shells and other Marine Bodies found at Land ; and am now upon that of the Plants ; having only that of the Brute Animals, that of the Humane Bodies, and that of the Fish, to finish. Now as to the performing it in such a manner, as to render the Design useful, that is to the hurrying it to an End ; and you and the rest of my Friends may depend upon't, that I will not lose one single Hour that I can spare from the Exigences of my other Affairs, till I have accomplish'd the whole. I am

S I R,

Yours, &c.

J. Morton.

V. An account of a very large Tumour in the fore part of the Neck, &c. By Dr James Douglas.

I Lately had the opportunity of opening a Woman, about 50 years old, who had a very large Tumour, or hard Swelling, in the fore part of her Neck, possessing all the space between the whole extent of the lower Jaw and the upper part of the *Sternum*, with a considerable rising in its middle ; laterally its point inclining to the Left side, tho the biggest part of the Tumour was on the Right. The Skin on the *Apex* of this protuberating part was thin and shrivell'd, of a colour different from the rest, and lookt as if the Swelling would have broke in that place.

The

The Skin was exceeding thin, I thought to find under it, only in a cavity between the Lobes, there was a small vessel, described, on its Right side, there was a small space, and one of the Lobes, for the Tumour, in its situation, it was not. One of the *Alumbræ adiposæ* were not quite separated.

The fleshy Fibre of the *Intercostal* was not visible.

The *Massoideus* and *Commissoræ* were eaten by time, and in their ascent they adhered very firm to the subjacent Tumour.

The *Sternohyoidæus* and the *Sterno-thyreoidæus*, that run up the fore part of this Swelling, were dilated so thin, that it was difficult to separate them from it, especially the last named.

The Right *Carotid* Artery, in its ascent to the Head, ran along its outer edge, which encreasing, did much obstruct the current of the Blood that way.

The Internal *Jugular*, the *Par Vagus*, and the Intercostal Pair went also over some part of this Swelling in their descent to the *Thorax*. Two of the Lymphatick Glands of the *Jugular* Vein were swelled to the bigness of little Eggs, being placed at some distance one from another, with a hollow between, where some Fat was found; these two Lobes made the Tumour very uneven also on its Right side.

These Muscles, the *Jugular* with the two Glands adhering to it, and the rest of the fore named Vessels being removed, on both sides, I could easily observe the bigness, the figure and the circumscription or limits of this preternatural Tumour, with all its adhesions to the adjacent parts.

In Magnitude it seemed to exceed that of two Fists joyned together.

Its figure was almost triangular, with a broad Basis under the Chin, sloping a little on each side, as it descended to the upper part of the *Sternum*, where its point

was pretty narrow ; its surface was made uneven by three risings, of which the last it was turned to the Left side ; the other two being placed on the Right, as above remarked.

It adhered by Membranous Filaments to the *Stylohyoid* Glands, to the *Digastrick* Muscle and to the *Hyoidæus* ; under which, on the Right side, a small portion of it, in the form of a Nipple, did it trade, as it were under the Tongue ; in the upper and fore-part it also adhered to the *Os hyoides*.

Laterally it was connected to the *Levator*, *Obliquus* and lower down to that part of the *Quadratus* which terminates into the *Clavicle*, backwards to all the fore-part of the *Aspera Arteria*, between its third or fourth Cartilaginous Ring and the *Os pectoris*, as also to that Muscle of the Head called *Rectus Internus major*, and to some part of the *Scaleni* ; its lower part was engaged under the *Jugulum*, or lunated part of the Breast-bone, to which it adhered.

It was easily freed from its connexions to all these different parts, but not so from the *Glandula Thyroidææ*, to which it adhered after a far different manner ; for where the *Thyroidal* Glands are joyned to one another, a little below the *Cartilago Cricoides*, on the fore part of the rough Artery, there was no separating of it without cutting its substance ; whence it plainly appears, that the Union of these Glands was the root or beginning of this excessive Tumour : And yet, which is very remarkable, the Glands themselves kept their usual figure, and were no larger than ordinary.

This Tumour was hard and very firm, exactly of the consistence of a Cows Udder when swollen, yet in a few places it was softish, containing a liquid and thick Juice.

Its Colour was chiefly of a Whitish Yellow, only in some places it was exceeding Red, from its having a greater

greater store of Blood Vessels, and in others it was very White.

I was not a little surprized to hear the edge of my scalpel grate against something hard, when I was cutting it, which made me proceed with caution, not to 'poll' whatever it was that made the resistance: I therefore peeled off all the soft part, and the hard substance that remained I boyled, and then cut it very well, having left sticking to it at one corner a little Cartilaginous Body, which possibly, had the Patient lived longer, would have acquired the same degree of Induration. It very much resembles a piece of white unpolished Rock Corals; but whether it may be reckoned ossious or if it be rather the Viscid Humour of the Glands hardened and concreted into this irregular Chalky or Gravelly Substance, or whatever else it may be, I leave, Sir, to your better Judgment to determine. See Fig. 1.

I remember about two years ago I found in the *Prostates* of a very old man, several nodules like White Peas, being of a saltern colour, yellow only smother on the outside; some of these were in the Body of these Glands, others adhered by small Root to the Muscular Membrane that invests them. Fig. 2.

The first appearance of this large Swelling, was about twenty years ago, caused by the breaking of a Vein, as the good Woman used to express it, in a hard and very difficult Labour. It increased but very slowly, not arriving to any considerable bulk till a few years before she dyed; it was never very painful, being a true *Schierhus*: Many things by several Persons had been used and applied unsuccessfully. Its bigness at length became very troublesome, in impeding her Swallowing and free Breathing, and at last it quite choaked her, by compressing the Wind pipe, upon which it lay.

But besides this, I observed another remarkable accident, which did much hasten her end, being very painful and troublesome for a year or two before she dyed.

The *Uterus* was entirely Shrivelled, and distended to that degree, that it filled up the whole Capacity of the *Pelvis*. Part of the *Colon* and *Ileon* adhered so firmly to it, that there could be no Separation without tearing: Both the *Ovaria* and the *Tubæ* grew close to it; and indeed the Confusion and Mixture of all these parts was so great, that if the *Ovaries* had not been swelled here and there with Hydatidal Tumours, I could not have distinguished them.

The Neck of the Womb was pressed down so low, that upon a very gentle dilatation of the *Labia* it offer'd itself to view, being extremely hard, but yet smooth and even. and so closely shut, that I could pass nothing without cutting.

It had squeezed the *Vesica Urinaria* so close against the *Os Pubis*, that it could contain but little or no Urine, which obliged her to make it often, and with pain.

The pressure of this part backwards was so great upon the *Intestinum Rectum*, that the evacuation of *Fæces* had been obstructed for the space of five weeks before she dyed.

Indeed there was observed to come away per *Annum* for some considerable time a great deal of Pus and Slimy Matter, but that proceeded from the *Uterus*; for the Menstruous Humour, which was wont to be discharged per *Vaginam*, having been pent up within its Cavity, by the close Constriction of the *Collum Uteri*, had corroded, and eat its way through the Substance of the Womb into the *Rectum*, by which it had its vent: A most deplorable case I have more than once observed.

The thickness of the Womb was near two inches, and in its bottom there was a great deal of this Humour, White and thick, which upon touching made the ends of my Fingers white and rough, by shrivelling the *Cuticula*, as if I had washed them with a strong Solution of some Acrid Lixivial Salt. Thus the Caustick Salt lodged in Soap affects the Hands of those Women that wash Linnen. It was very hard to take the *Uterus* out of the *Pelvis*, by reason of its so close adhesion to the neighbouring parts.

I had forgot to take notice, that the *Feces Aloine*, contained in the Guts, were but few, by reason she could not swallow any thing solid for a long time, but very hard, and in several distinct Clots.

this manner it was again put into the Water, and suspended as before on the Ballance, and it then weigh'd but 175 Grains and a half, which Subtracted from the first Weight, gave 183 Grains the Difference; and was the weight of the Quantity of the Air drawn from the Bottle by the Pump. Then opening a Cock under Water, the Water was at first violently Impell'd in the Bottle, (but Abating Gradually of its force,) till such a quantity was enter'd as was equal to the bulk of Air withdrawn. (So that by Making the Experiment after this manner, a person need not be very sollicitous in the nice Exhaustion of the Receiver, for it must of necessity Answer Reciprocally to the Respective Quantities taken out, the Remaining Air being weigh'd at last as well as at first, and no greater quantity of Water can Enter the Receiver, than what will supply the space deserted by so much Air.) The Bottle now being again weigh'd, it was found to be 162132 Grains. From which 175 Grains and a half being subtracted, (which is the weight of the Bottle more than its like bulk of Water) there remain'd 161956 Grains and a half, which being divided by 183 Grains, the weight of the Air taken out of the Receiver, gave the Proportion as 885 to 1. The *Averdupoise* Weights being brought to Ounces, I reduc'd to Grains, by multiplying them by 438, the just number of Grains contained in an Ounce of that Weight. The Column of *Mercury* in the Barometer at the same time Measuring 29.7 Inches. The Season of the Year is to be consider'd, (which was May,) and I doubt not but if the Exp. ----- in *December* or *January*, a sensible difference will ensue.

VIII. *An Experiment made at Gresham-College, shewing that the seemingly Spontaneous Ascention of Water in Small Tubes open at both ends is the same in Vacuo as in the open Air. By Mr Fr. Hauksbee, F. R. S.*

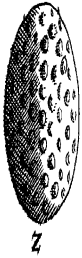
I Took three pieces of small Tubes of Different bores, and fixt them in a piece of Cork directly Perpendicular, with their Lower Orifices as nicely even as I could. The same Cork I likewise fasten'd to a Wire, which pass'd through some Collars of Leather, included in a Box on the Upper Plate of the Receiver; by which means, I could at pleasure elevate or depress the Tubes without any danger of the Air's Insinuation. (See Fig. 4.) Thus prepar'd, and ting'd Water set on the Plate, the small Tubes (which never had been wetted) were drawn to the upper part of the Receiver by the premention'd Moveable Wire. Then the Air being withdrawn, the Tubes were caus'd to descend (by the same Wire as drew them up) till their lower ends were plung'd just under the surface of the ting'd Liquid; where they no sooner were, but the Water rose in each of them a considerable height above its surface in the Glass, and higher in the smaller Tubes than the larger; and would retain such a quantity as voluntarily arose in them, (if I may call it so,) notwithstanding their lower Orifices were drawn out of the Water. Upon letting in the Air again they continu'd just the same as *in Vacuo*. I found by plunging Tubes of several sizes in the ting'd Li-

Liquid, that so much of the Liquid would remain suspended in them, when taken out of it, as it would in such Tubes when plung'd be Elevated above the surface of the Stagnant fluid: I have likewise since observ'd, upon bending some small Tubes by the flame of a Candle, in manner of Syphons, that it would require the Orifice of the longer Leg to be at least so far below the surface of the Stagnant Water, as that Water in the same Tube would spontaneously ascend in it, before it would run.

*London, Printed for Sam. Smith and Benj. Walford, Printers
to the Royal Society, at the Prince's Arms in St. Paul's
Church-yard, 1706.*

Tab: 1.

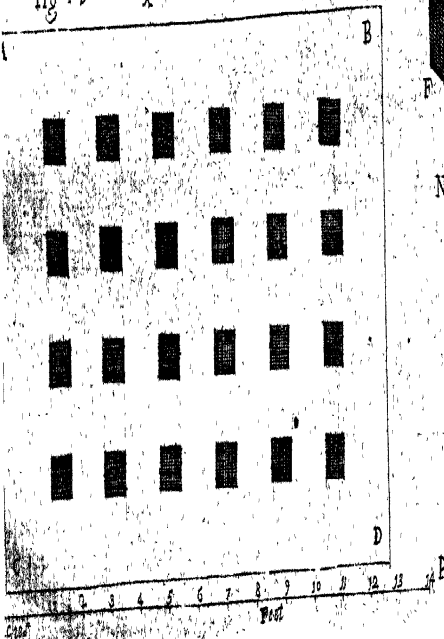
f: 7. Y.



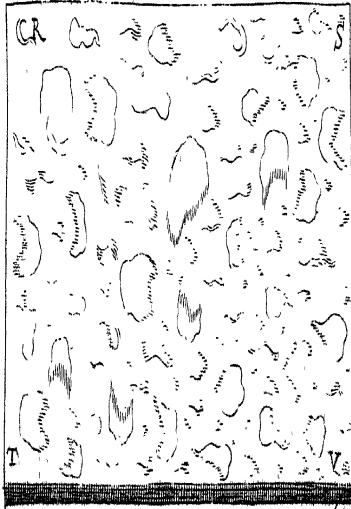
f: 6.



Fig: 1.



f: 5.



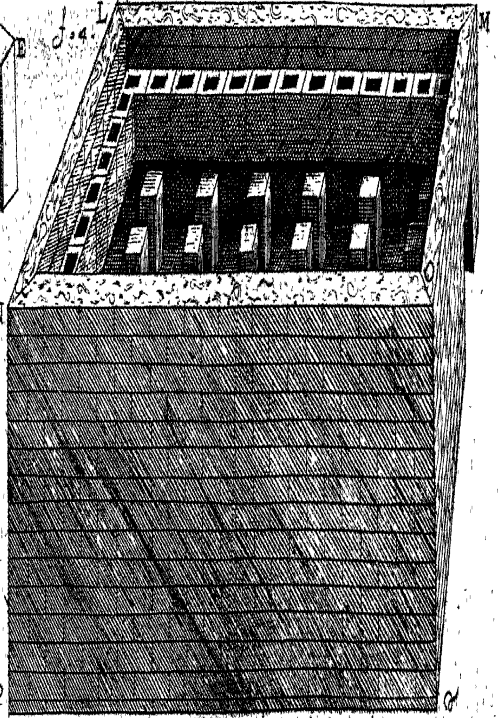
f: 3.

G					H
K					I

f: 2.



f: 4.



For the Months of April, May, and June, 1706.

- I. A Description of a Roman Sudatory, or Hypocaustum, found at Wro-
xeter in Shropshire; Anno 1701. By Mr John Iylter. Communi-
cated to the Royal Society by John Harwood, LL. D. and F. R. S.
- II. A Letter from Dr John Harwood, LL. D. and F. R. S. to Dr Hans
Sloane, R. S. Secr. concerning the forementioned Hypocaustum. With
Part of two Letters from Mr William Baxter to Dr Harwood, relating
to Wroxeter, and the Hypocausta of the Ancients.
- III. A Letter from Dr William Murrgrave, Fellow of the College of Physi-
ans, and R. S. to Dr Hans Sloane, R. S. Secr. concerning the Jaundice,
occasioned by a Stone obstructing the Ductus communis biliaris, which
~~was afterwards voided by Stool~~.
- IV. Part of a Letter from Mr Ralph Thoresby F. R. S. giving a farther
Account of an Eruption of Waters in Craven.
- V. Observations of the Solar Eclipse May 1-12. 1706. At the Royal Ob-
servatory at Greenwich, &c. communicated by the Reverend Mr John
Flamsted, Math. Reg. & F. R. S.
- VI. An Abstract of a Letter written from Geneva, May the 28th, 1706.
N.S. by Monsieur J. Chr. Facio Duillier, Esq. & to his Brother Mr
Nic. Facio, R. S. S. Containing some Observations of the Sun's Eclipse,
on the 1st of May, 1706. N.S.
- VII. Pars Epistola a Cl. D. Joh. Jac. Schmeidler, Ad Dr. Johann G. Socie-
tat. Reg. Lond. Sed. ad Dr. Jacobum Frey, Medici Societatis de Basilijs
Solis utraque Die 12a Martii Viginti et Octavo.
- VIII. An Account of a singular Case of Cancer, in John Bayles of Nor-
ampton, repeated to himself twice, &c. &c. By Dr James Keil:
Concerning the Constitution and Properties of a new Quadratrix to the Hyperbola.
By Peter Berke. Communicated by Mr Abr. de Moivre, F. R. S.
- X. Sanctiones, & Phlegmata per Annationem ad Admiratione Medi-
cae Supplementum. Medicamentorum Empiricorum Supplicia per Longo o-
missa, completissima. Admiratione Theriacalis, & Antivenereum
Symptomata, Differentia, & Curatione. In gra-

- I. *A Description of a Roman Sudatory, or Hypocaustum, found at Wroxeter in Shropshire, Anno 1701. By Mr John Lyfter. Communicated to the Royal Society by John Harwood, LL. D. and F. R. S.*

ABout 40 Perches distant North from a ruinous Wall, call'd the *Old-Work of Wroxeter*, once *Uriconium*, a famous City in *Shropshire*, in a piece of Arable Land, in the Tenure of Mr *Bennet*, he observed, that altho these Fields had formerly been fertilized and made very rich by the Flames and Destruction of the City, yet a small Square Parcel thereof to be fruitless, and not to be improved by the best Manure. He then guessing the Cause of Sterility to be underneath, sent his Men to dig and search into it; but the Soil being then unfown, caus'd them to mistake, and search in a wrong place; where they happen'd upon Bottoms of old Walls, buried in their own Rubbish, (being such as are often found in those Fields;) and the Inhabitants digging one of them up, for the benefit of the Building-Stone, were thereby guided to the Western Corner of the said unprofitable Spot of Land: Where they found (near the Foundation) a little Door-place, which, when cleansed, gave Entrance into the Vacancy of a square Room, walled about, and floord under and over, with some Ashes and earth therein.

This was built in times past (as we suppose) for a *Sudatory* or *Sweating house*, for Roman soldiers, and long sit with 4 Banks of small Brick Pillars, 8 inches square, and laid in a strong sort of very fine Red Clay; each Pillar being

being founded upon a foot square Quarry of Brick ; and upon the head of every Pillar was fixed a large Quarry of 2 foot square, hard almost as Flint, as most of those *Roman* Bricks are, and within as Red as Scarlet, and fine as Chalk. These Pillars were to support a double Floor, made of very strong Mortar, mixed with coarse Gravel, and bruised or broken Bricks : The first of these Floors was laid upon the large Quarries, and, when dry, the second Floor was laid upon it.

But first there was a Range or Rank of Tunnel-Bricks, fixt with Iron cramps up to the Wall within, with their lower ends level with the under sides of the broad Quarries, and their upper ends with the surface of the upper Floor ; and every Tunnel had alike 2 opposite Mortice-holes, one on either side, cut through for a cross passage to disperse the Heat amongst them all. The Form of the whole will be better understood by inspecting the Figures.

Explanation of the Figures.

Fig. 1. A. B. C. D. is the Ground Plat, on which the Pillars of Brick stand.

Fig. 2. E. F. is one of the said Bricks ; which are in Numb. 24.

Fig. 3. G. H. I. K. is the Ceiling of Square Tiles, which lye upon the Heads of the square Pillars.

Fig. 4. L. M. N. O. P. Q. is the Sweating-House, in Perspective, shewing in part the Manner of the Floors and Pillars as they were placed.

Fig. 5. R. S. T. U. is the double Floor, whose upper surface lies even with the tops of the Flews in the Perspective Draught.

Fig. 6. W. X. is one of the Flews, or Tunnel-Bricks.

II. *A Letter from Dr John Harwood, LL. D. and F. R. S. to Dr Hans Sloane, R. S. Secr. concerning the forementioned Hypocaustum. With Part of two Letters from Mr William Baxter to Dr Harwood, relating to Wroxeter, and the Hypocausta of the Ancients.*

S I R,

THe first notice I had of the *Hypocaust* discover'd at *Wroxeter*, was from a Letter Mr *Baxter* communicated to me, which he receiv'd from the Reverend Mr *Markham*, the present worthy Incumbent of that Place; which gave me occasion of making farther enquiry, by writing to the Reverend Mr *Richard Lloyd* of *Salop*; who, at my request, was so obliging as to take a Journey and view it: The Remarks he then sent me, being mislaid, I must refer you to Mr *Lyster's* accurate Model and Description, which I am glad to hear you are about publishing in the *Phil. Transactions*. I have for some years cherisht an Acquaintance with Mr *Lyster*, whose Assistance in the late Edition of *Camden* ought not to have been past over in Silence, but deserv'd a more publick Acknowledgement; sure I am, had it not been for this Worthy Person, the Memory of so remarkable a Piece of Antiquity wou'd in all probability have been lost to Posterity.

I think it not impertinent, upon this occasion, that some Account shou'd be given of the Place where it was discovered.

discover'd, as likewise of the nature or kind of the Antiquity itself: And certainly *Wroxeter* was one of the most Considerable Military Stations or Colonies the *Romans* had in this Island; the City Wall, as appears from a Survey taken by Mr *Lyster*, was not much less than three Miles in Circumference; 'tis not improbable, but that it was founded by *Suetonius Paulinus*, or after by *Agricola*, in their March to subdue *Mona*, now *Anglesey*: But not to trouble you with my own Conjectures, I send you along with this an Extract out of a Learned Work (which I hope will e're long see the Light,) I mean A *Glossarium Antiquitatum Britannicarum*, which was transmitted to me, by the obliging Author, my worthy Countryman, Mr *Baxter*, whose Skill and Knowledge in our *British*, *Roman* and *Saxon* Antiquities, as well as in all other useful Literature, is sufficiently known to you, and the rest of the Learned World.

The other Paper I send you, is A Letter I received some time since from the same Worthy Person, in Answer to some Enquiries relating to the *Hypocausta* of the Antients.

Since I did my self the Honour of presenting Mr *Lyster's* *Module* to the Society, I have been inform'd by the justly-admir'd *Vitruvius* of our Age and Nation, Sir *Christ. Wren*, that he discover'd the remains of such another *Hypocaust*, when they were laying the Foundation of the Kings House at *Winchester*.

Mr *Christ. Hunter*, in a Letter to Dr *Lyster*, dated May the 4th, 1702. since publish'd in the *Transactions*, gives an Account of an Antiquity of this kind dug up in *Yorkshire*, as appears from the Description he gives of it, in the *Phil. Transf.* for the Months of *March* and *April*, *An. Dom.* 1702. Numb. 278. p. 1131.

The Ingenious Mr *Edward Lhwyd* in his useful Additions to *Camden*, takes notice of another discover'd at *Kaerhyn* in *Caernarubshire*; one of the Hollow Bricks or Tunnels

nels whereof he there describes, and gives a Figure of it, in the Table of the Curiosities added at the end of the *Welsh* Counties; it occurs Numb. 8. to which I refer you.

Mr *Camden* himself mentions an *Hypocaust* discover'd at *Hope* in *Flintshire*, an Account of which is to be met with in his *Britannia*, Pag. 688, of the *English* Edition.

You see, Sir, how ready I am to comply with your Commands, and shou'd be glad of any other occasion, of farther approving my self

Your Obliged Humble Servant.

Mr Baxter's first Letter to Dr Harwood, concerning Wroxeter.

I Now transmit to you what I have Written in my *Glossarium Antiquitatum Britannicarum* concerning *Wroxeter*.

VEROCONIUM Antonini, atq; Ptolemæi Raven-
nati Monacho prodigiôsè, ut ferè omnia, **UTRICO-**
NION est **CORNONINORUM**, pro **VERO-**
CONIUM CORNOVIORUM, undè discimus
VEROCONIUM, seu **VERICONIUM**, fuisse
CORNAVIA RUM, five **GORNÓVIORUM**
caput. Saxonibus **VRECENCEASTER**, nobisq;
hodiè correptè **WROXETER** est, pro **WEROCC-**
CESTER. Nomen dedit hæc Urbs vicino monti
WREKEN appellato, atq; etiam vicino vico **WROC-**
WARTDIN, quod **ARGEM** sonat **VEROCONI-**
ENSE. M. Nennio Britanno **CAER URNACH** appel-
latur; verum corruptè puto pro **CAER URNACH**
UAG, five **CIVITAS** ad **CERVICEM AQUÆ**.
De **URNAGO** enim Gigante, de quo crepant Britan-
nicarum Fabellæ, piget quicquam referre. Neque sub
VEROCONIUM ipsum quicquam aliud sonat,
sed **VEROCONIUM**, five, **CERVIX AQUÆ**.
PAIN.

PRINCIPIS, vel SABRIANÆ. Nam & COND, & KEND Britannis erat pro CAPITE, & PRINCIPLE. Idem igitur COND IL, five CON IL quod & SAVRIAN, five AMNIS REGINA. Extat etiam antiqui operis insignis Parietina, accolis vocati THEOLDWORK, five ANTIQUM OPVS, vel ÆDIFICIUM: quod equidem conjecerim ex Arcum vestigiis Romanum fuisse Balneum. Antiqua durat inter plebem fama, hanc Urbem fuisse, immixtis de VEROCONIO monte Passeribus, à Danis incensam; quod quid sit alij forsitan melius dicent. Certè vel ferreum sigillum ibi erutum cui Reguli cujusdam Christiani caput Romano Diademate cinctum, & promissa comâ, sub hac Inscriptione CAPUT SERVI DEI, satis indicio est, eam non fuisse à Saxonibus deletam. Hujus Sigilli Eclypon aliquot retro annis perquam humaniter mecum communicavit modò Reverendus VEROCONIENSIS Ecclesiæ Presbyter, *Thomas Markham*. Imò & crediderim vel ex Ravennatis Itinerario eam ad ejus tempora, hoc est penè ad Octavum Sæculum, adeoque aliquanto diutius, floruisse, & caput fuisse CORNAVIVM, forsitan etiam Regia Merciorum Sedes. De tantæ urbis ruderibus, melioribus, uti quidem speramus, auspiciis caput suum extulit VEROCONIUM NOVUM, non ita longe à vetere positum, de Alneto Britannis, ut vulgo fertur, dictum PENGUERN; cum nobis ex Auctoritate vetustissimi cujusdam Bardi PENGVERN POWYS sit in VENEDOTTIS in Agro Montegomerico. Saxonibus appellatur SCROBESBYRIG, quod est CIVITAS INDUMIS. Britannis etiam hodie eodem plane intellectu AMWYTHIC. Siquidem WYDH, five GWYDH, vel, ut in Legibus Regis Howel scriptum legimus, WYTH Britannis dicitur SYLVA, additaq; Præpositione AM, quod illis, ut & Latinis circum est, AMWYTH dicentur *humiliora fruticeta*, Saxonibus SCROBES, & vernacula Dialecto SHRUBS. De AMWYTH etiam

Adjectivum effingitur AMWITHIC, five DUMOS-A. Normanni tandem, complanato agresti sono, de SCROBESBERIE fecêre SLOPESBERIE, de quo Latinizantium SALOPIA, ut & SALISBERIE de SARISBERIE. Hæc equidem eo libentiùs commemoro, quo antiquæ Patriæ meæ memori-
am redderem illustriorem. Siquidem in hæc Urbe duobus retro sæculis Majores mei Duumviratu, summo ejus loci honore, functi sunt, posteriq; eorum civitate gaudent perpetuâ: quod de Romano antiqui VEROCONII jure tractum existimo.

A second Letter from Mr Baxter to Dr Harwood, concerning the Hypocausta of the Ancients.

S I R,

THE Ancients had two sorts of *Hypocausta*; the one called by *Cicero*, *Vaporarium*, and by others, *Laconicum*, or *Sudatio*, which was a large Sweating Bath. In which were *Tria vasaria æbena*, called *Caldarium*, *Tepidarium*, and *Frigidarium*, from the Water contained in them. The other sort of *Hypocaustum* is not so distinctly handled by Antiquaries, and it was a sort of a *Fornax*, or Kiln to heat their Winter Parlours, or *Cœnatiuncula Hybernæ*. *Erat & Diata*, five *Cœnatiuncula* (saith *Argol* upon *Panvinus*) *sub quâ ignis accendebatur: Unde & Cœnatio Hypocaustum*. *Cœnationes Æstivæ & Hybernæ*, are mentioned by *Cicero* in *Epistola*. The Terrace Floor is called by *Vitruvius*, *Tesudo*. *Tesudinæ Alveorum in Communi Hypocausti calefacientur*, saith the same Author. This *Hypocaustus* was called *Alveus*, and *Fornax*: And the Man that tended the Fire *Fornicator*. The *Tubuli* seem to have been contrived to convey away the smother, that otherwise would choke the *Fornicator*. This kind of Stove seems to be graphically described by *P. Statius* in *Balneo Hebrusæ*.

——— *Ubi Languidus in Terrat*
Ædibus, & terram voluit Hypocausta vaporem.

Of the Terrace *Agol* has these words: *T. stulines sunt pavimenta sub quibus Fornax ardet.*

P. S. By the way, I take the word Stove to be derived from *Æstus*, quasi *Æstivium*: there wanting hitherto a probable Etymon.

III. *A Letter from Dr William Musgrave, Fellow of the College of Physicians, and R. S. to Dr Hans Sloane, R. S. Secr. concerning the Jaundice, occasioned by a Stone obstructing the Ductus communis bilarius, which was afterwards voided by Stool.*

S I R,

BEing of late at *Clifton*, in *Dorsetshire*, the Seat of Mr *Harvey*, Nephew to the Celebrated Physician of that Name, I was there shewn a Curiosity, which I thought remarkable, and may perhaps be worthy your notice.

It is a Stone, that Gentleman voided, some years since, by Stool; and which he represented to me, as having come from the *Ductus communis bilarius*: But the Largeness of it is such, as made the latter part of the account seem, at first hearing, somewhat dubious.

The Figure of this Stone is Oval; the Length almost an Inch; the Breadth, (or thickest Diameter) $\frac{1}{4}$ of an Inch: It weighed 59 Grains, when I saw it; but, at its coming off, was (as I am inform'd) above a Dram in weight:

Some

Some part of it being, by frequent handling, rubb'd away. The Surface rough, unequal, divided into several little Risings, each about the size of half a Vetch, or somewhat less.

You have in Fig. 7. Y. E. The Proportions exactly drawn

The many strong annular Fibres, which appear not only at the Orifice, where the *Ductus communis* opens into the *Duodenum*; but also all along the oblique passage, of that *Ductus*, between the Coats of the Intestine, (which passage is, according to Dr Glisson's measure, about half an inch in length) do, by way of Sphincter, keep this end of the *Ductus communis* very strait and close. And besides this straitness of the *Ductus*, the two Oblique Inflexions, it makes at some distance from one another, thro' the two outer Coats of the *Duodenum*, render it yet more difficult, for a substance of any Bulk, to pass this way. So that, however great Stones may be generated in the Gall-Bladder, *Ductus Cysticus*, *Hepaticus*, or *Communis*, it is not easy to conceive, How a Stone of the Magnitude here describ'd, could possibly, through a passage of itself so very narrow, strait, and difficult, be conveyed into the *Duodenum*.

From these Considerations, I was extremely desirous to hear, what could be said, to Prove, That this Stone was not form'd in the *Fistula alimentaris*, but (large, as now it is) came this way into it. In answer to which Inquiry, the Gentleman was pleas'd to let me know,

That, before the Discharge of this Stone, He had the *Jaundice*; which came suddenly on him, and continued several months, in a severe, and most excessive manner.

That this *Jaundice*, beside the discolouring of his Urine and Skin, to a very great degree; beside Loss of Appetite, Faintness, and many other Symptoms, usual in this Disorder, was also accompanied with a Pain (in, or) near the *Stomach*.

That

That, during this *Jaundice*, his Stools were of a white colour, as having very little, or no Mixture of Choler in them.

That, Travelling under these circumstances, more especially with a constant Pain, (as before mention'd,) in his Coach from *London* to *Clifton*; and, after a little time, to *Bath*; he found, a little after his Arrival at *Bath*, this *Stone* come off by Stool; and, together with it, almost a Spoonful of *Gravelly Matter*; and a considerable quantity of Choler, as appear'd from the yellowness of the Stools: All which happen'd so soon after he came to *Bath*, as Evidently to prove, the Discharge of both [Choler and Stone] to proceed from the motion of the Coach.

That his deliverance, from the *Jaundice*, commenc'd from the Expulsion of this Stone: For, soon after that, the Colour of the Skin and Urine, indeed all the ill Symptoms vanish'd; and, in a very little time, (Weakness only excepted) He recovered.

These Propositions, put together, make a considerable Argument, That the Orifice of the *Ductus communis* (how strait, and how strong soever) was, in this Gentleman, so far dilated, as to give way to the *Stone*, here described; that is, dilated to a Circle, in Diameter $\frac{7}{8}$ of an Inch, in Circumference one whole Inch and $\frac{1}{4}$.

The *Jaundice*. is often observ'd, to be a most stubborn Distemper; not easily yielding to our most probable Methods; and many times to none at all. *Riverius* positively affirms, That, when it proceeds from a Stone obstructing the Current of the Choler, it is incurable: Urging this reason for his opinion; *Calculus, cum dissolvi non possit, morbum facit incurabilem*. Capite de *Iktero*.

When the *Jaundice* is thus difficult of Cure, especially when there is a Probability (whether from a Pain fixt in, or near the Region of the Liver, or from any good Argument whatsoever) That it arises from the Cause now mentioned; rather than to Beat over the same ground to

no purpose, or other ground equally improbable ; it may not be amiss, to advise Exercise on Horseback, in Coach, or any other such way, as shall be likely to dislodge the Stone, and bring it off.

But, to make this Exercise effectual, it ought to be Violent, as the Patient can well bear it ; and in such manner, as may, by much agitation of the Body, be most conducing to the Design in hand.

The History, here mentioned, does sufficiently recommend this *Gymnastic Course* ; as capable of relieving, in some Cases of the *Jaundice*, when the best methods of Physick (for such we ought to suppose this Gentlemen had prescribed himself) fail of success.

Exon. Feb. 23. 1705-6.

IV. Part of a Letter from Mr Ralph Thoresby, F. R. S. giving a farther Account of an Eruption of Waters in Craven.

IN *Philos. Transact.* Number 243, is register'd the Vicar of *Kildnick's* Letter, which gives an account of an extraordinary Eruption of Water in *Craven*. I was lately enquiring further concerning it, of one that is now my Tenant and Neighbour ; and am not only fully satisfied of the Truth of what the said Mr *Pollard* affirms, but also that, as he conjectures, a great part of the Land is not to this day recover'd from the Sand and Stones, though a great number of People were employed about it. Upon the opening of the Rock, at the foot of which the Town of *Stamby* stands, the Water gushed out in so vast a quantity, as if it would have swept away the whole Town :

Town : The Waves came rolling down, like long Swarths of Grass, one upon another, to use the Metaphor of the Relater, who had never seen the Sea. Several Houses were utterly ruin'd, and others wreckt up to the Chamber Windows ; one particularly so covered, that a great piece of the Rock was left upon the top of the Chimney. These things my Neighbour was an Eye-Witness of, and had many a weary day in clearing some part of his Land. His House was, for some time, full of Neighbours, who were harbourless by this sudden Accident.

Leeds, August 20, 1705.

V. *Observations of the Solar Eclipse, May 12. 1706.*
At the Royal Observatory at Greenwich, &c. communicated by the Reverend Mr John Flamsted,
Math. Reg. & F. R. S.

THe Morning was Cloudy and Mist till about eight o'clock, when the Clouds began to break, and we had sometimes a sight of the Sun through the spaces between them. A Sevenfoot Telescope, was fitted up, with a Screen to receive the Species of the Sun cast through it, and on which it was about seven inches diameter, divided into digits by six concentrick Circles. But Clouds coming, the Sun frequently rendred this way of observing inconvenient, and therefore laying aside the Apparatus of the Scene, I viewed him through the same Telescope with Smoaked Glasses, to save my Eyes, as I thought:

1706. Time corr.
 May 1st by the
 St. N. Pend.
 Mane. Clock.

2 21 30 A very small part of the \odot diameter was eclipsed.
 28 00 The Chord of the Arch of the \odot periphery
 eclipsed was $14'.40''$. then followed frequent
 Clouds through the spaces betwixt; then some
 Zenith distances of the Sun were taken for
 correcting the Clock, and afterwards near the
 middle of the Eclipse.

9 21 46 The parts of the Diameter remaining clear 5 00
 26 20 4 30

Frequent large Clouds again till the Sun appear-
 ed through the breaks, and we saw the Eclipse
 was not ended. Clouds again till

10 31 50 When the Sun shone out again we saw his Limb
 10 33 50 re-appear, and the Eclipse certainly over.

At Canterbury.

MR St. Gray had prepared a Scene placed behind his
 seven foot Glass, so that the Species of the Sun
 projected on it was seven inches over; but having the
 same sort of Weather we had at Greenwich, he saw not
 the beginning, by reason of Clouds, but other Phases with
 the end he noted as follows.

Correct

Correct time
by the Pend. Clock.

h			
8	53	digits 5 $\frac{1}{2}$	darkned
9	08	_____	7
	31	_____	10 or more
	36	_____	The Sun shining for a short time, the Eclipse seem'd to decrease.
	55	_____	7 $\frac{1}{2}$ a little clearer.
	57	_____	6 $\frac{3}{4}$
10	02	_____	6.
	4	_____	5 $\frac{3}{4}$
	14	_____	4
	16	_____	3 $\frac{3}{4}$
	20	_____	2 $\frac{1}{2}$
	30	_____	1
	31	_____	0
10	36	The end accurately with a Tube of 16 foot.	

At Horton, near Bradford in Yorkshire.

MR. Abr. Sharp cast the Species of the Sun on a Scene-plate, behind his Seven foot Glass, so as it appeared seven inches over. By reason of Cloudy Weather, he saw neither the beginning nor end: But other Phases near the middle, as follows.

Times correct by
the Pend. Clock.

h	"		
8	33	00 digits dark	3 $\frac{1}{2}$ by Ocular Estimation.
9	01	00	7 $\frac{1}{2}$
	4	54	8 $\frac{1}{10}$ Eclipsed on the Scene.
	6	33	8 $\frac{1}{2}$
	7	53	8 $\frac{1}{10}$
	12	50	9
	16	08	9 $\frac{1}{10}$
	18	48	9 $\frac{1}{2}$ exactly, the \odot shining out clear.
	20	45	9 $\frac{1}{2}$ the \odot still shining clearly. Great- est obscurity.
	21	48	9 $\frac{1}{2}$ still clear.
	28	46	9
	44	45	7
	54	42	5 $\frac{1}{2}$
10	06	10	3 $\frac{1}{2}$

10 06 10 ————— 3 $\frac{1}{2}$ precisely.

24 00 The \odot seen thro' Clouds, the Earth not dark.

25 00 The \odot seen again perfectly round and entire.

From Bern in Switzerland.

Captain Ouchyon, who was there with his Kinsman, Lord
Majesty's Envoy writes the same day to him that the
Sun was totally darkened there for 4 $\frac{1}{2}$ minutes of Time;
that a faint Star and a Planet appeared very bright; and
that a great part of the People was preceded by a Blood
red streak of light from the Left Limb, which continued
not longer than 6 or 7 seconds of Time; then part of
the Sun's Disk appeared, all of a sudden, bright as it
was ever seen in the night; nay, brighter; and it then
very instant gave a Light and Shadow to things, as
the Moon-light uses to do.

The Captain is the first man I ever heard of that took notice of a Red Spark and Light preceding the emersion of the Sun's body from a total Eclipse. And I take notice of it to you, because it infers that *the Moon has an Atmosphere*; and its short continuance of only 6 or 7 Seconds or Time, tells us that *its height is not more than the 5 or 6 hundredth part of her diameter.*

VI. *An Abstract of a Letter written from Geneva, May the 31th, 1706. N. S. by Monsieur J. Chr. Facio Duillier, R. S. S. to his Brother Mr Nic. Facio, R. S. S. Containing some Observations of the Sun's Eclipse, on the 12th of May, 1706. N. S.*

THe total Eclipse of the Sun, which happened on the 12th of May, 1706. N. S. did present to the Inhabitants of *Geneva* a magnificent and surprizing Sight. The more Learned did observe that Eclipse with much Satisfaction. But it did strike many of the Common People with a great deal of Terror. A little after the Sun's rising the Sky did seem clear; tho' the Air was thick already with some Vapours. Many little Clouds did afterwards arise here and there, and the Vapours did much encrease. For want of a Pendulum Clock, in a convenient place, the Moment of the total Immersion, the Moment of the first Emersion, and that of the End of the Eclipse, could not be accurately observed. Tho' the Sky was somewhat overcast, the Heat of the Sun was already felt, when the Eclipse did begin; but a very sensible Coolness took place, as the Moon did by degrees,

cover a greater and greater part of the Sun, and the Light decrease. The Eclipse was observed only with some Glasses, either darkned with Smoak, or but little transparent; and by receiving the Sun's Image, through a six foot Telescope, which represented the Objects inverted, upon a white Paper, placed at some Distance, from the Eye-Glass. When the Sun was near being totally dark, the bright Crescent, which did remain, was seen to diminish more and more, upon the Paper, where its Image was received. And when that Crescent was reduced to a very narrow Breadth, and to a very little Length, it was seen of a sudden to disappear: And in that Moment the whole Sun was eclipsed. At the same Instant of Time, the Darkness, which was already very considerable, did become much greater. The Clouds did change of a sudden their Colour, and became Red, and then of a pale Violet. There was seen, during the whole Time of the total Immersion, a Whiteness, which did seem to break out, from behind the Moon, and to encompass it on all sides equally. The same Whiteness was but little determined, in its outward Side, and was not broad the twelfth part of the Diameter of the Moon. This Planet did appear very black, and her Disk very well defined, within the Whiteness, which encompassed it about, and whose Colour was the same, with that of a White Crown, or *Halo*, of about four or five Degrees in Diameter, which accompanied it, and had the Moon for its Center. The Star of *Venus* was seen, at the same time, at some Distance, without that Crown, between the East and N. E. in reference to the Sun. The Planets of *Saturn* and *Mercury* were seen also by many, Eastward from the Sun's place. And if the Sky had been clear, many more Stars might have been seen, and with them the Planets of *Jupiter* and *Mars*; that towards the East, and this toward the West: And so, the seven Planets might have been seen, almost all at once. According to some

some Gentlemen, being in the Country, did tell, as is said, more than sixteen Stars. And many people, which were on the Neighbouring Mountains, did see the Sky Starry, in some places, where it was not overcast, as during the Night, in the time of the full Moon. The total Immersion did begin about three Quarters past nine. The Duration of the total Darkneds was precisely three Minutes, or 180 Seconds, to the Moment that the first Ray of the Sun did begin to appear again, with much Brightness. And this Time was observed, with a simple Pendulum; which was afterwards compared with a Pendulum Clock, shewing the Seconds, and regulated upon the mean Motion of the Sun. The Council was met, during the time of the Eclipse; but they did rise from their Seats, a little before the total Obscuration; because one could neither read nor write. They perceived, as they came down the Stair case of the Town-House, some Swallows amazed, looking for a resting place; and many Bats flying out. In other places the Hens and Pigeons would make haste towards their Houses. There were seen, in several places of the Town, some Persons of the *Roman* Religion, and among them two Priests, prostrate on the Ground, and praying; thinking that the last Day was come. A little after the Sun had begun to appear again, the Whiteness and the Crown, which did encompass the Moon, did entirely vanish. The Sun did then shew itself more and more; appearing at first as a little Crescent, which did still increase; and whose Concave Side did seem terminated, as by an Arch, described with the Compass. A little before the total Obscuration, the Country, on the West Side, did already seem overcast with Darkneds; and after the total Obscuration, the Darkneds was seen to leave us more and more, and to fly Eastward. According to Mr. Professor Gaurer's Observations, from the first Emergence of the Sun, to the End of the Eclipse, there was

1^h 9' 30". As to the accurate times they are uncertain, the Pendulum Clock having been set only by a small Sun Dial. I send you also the following Account, which the same Gentleman did communicate to me.

" Observations on the Eclipse of the Sun, of the
 " 12th of May, 1706, made at *Marseilles*, in the
 " Observatory of the *Jesuits* of *St Croix* ; by
 " Monsieur *Chuzelles*, Engineer of the Gallies,
 " and by Father *Laval*, *Jesuit*, Royal Professor
 " of Hydrography.

	h	'	"
" The Eclipse did begin at _____	8	28	40
" It did reach the Sun's Center at _____	9	6	11
" It was total at _____	9	34	15
" The Sun did begin to appear again at _____	9	37	9
" The Eclipse did come again to the Center at _____	10	12	23
" It did entirely end at _____	10	47	50

" Three Stars were distinctly seen ; and during three
 " Minutes it was not possible to read ; and there did re-
 " main one bright Dight, all about the Globe of the
 " Moon.

" The Manor House of *Duillier* is in the Latitude of
 " 46° 24'. In Longitude it is 4° 13' 45" to the Eastward
 " of the Royal Observatory at *Paris*. And *St Peter's Church*
 " at *Geneva* is, in Latitude, 0° 12' to the Southward,
 " and in Longitude, 0° 5' 2" to the Westward of *Duillier*.
 " But of this another time.

" Before I make an end of this Abstract, I must take no-
 " tice that According to these Observations, the Altitude

" than of 190 Miles, in perpendicular height : and which
 " Miles 60 go to one Degree of the Earth. Neither could
 " the Atmosphere be discovered, before the time of this
 " Eclipse, by any Refraction of the Sun. Probably be-
 " cause of this Refraction's smallness ; and for want of pro-

proper Observations. And tho it was very plain that the Atmosphere of the Moon must needs shew itself, in the time of a total Eclipse of the Sun; yet I do not know that any body did think of this, till, in the last Month of *May*, many Persons did actually see it. Such as have read Monsieur *Hugens's Cosmo-Theoros* may guess how much this Discovery would have been acceptable to that Illustrious Author.

Some particular Observations, which are intended to be made publick, do evince that our Atmosphere is sometimes visible, all along, from the Surface of the Earth to the perpendicular Height of one Semidiameter of the Terrestrial Globe. And the continued Appearance of a Crown, of only four or five Degrees Diameter, about the Sun, during the whole time of the total Obscuration, does shew that the *Aethereal Matter*, in which that Crown was produced, must be at a very great Height above the Surface of the Earth. But if that Crown was to be seen, so far as the Weather did permit, in all the Places, where the Eclipse was total, it must be concluded, that the Cause of it was not in our Air, but in some Vapours incompassing the Sun: And probably, in those very Vapours, which produce that pointed Light, that has been observed lying in a manner along the Ecliptick, and that has the Sun for Center. Now either of these Conclusions, *viz.* concerning the great Height of the parts of our Atmosphere, capable of producing that Crown, or else concerning a Meteor observed, not in our Air, but in the Vapours that incompass the Sun, is very singular, and deserves a great deal of attention. If ever such another Appearance should be seen, in the time of a total Eclipse, it would be proper to observe accurately the least Diameter of the Crown, from inside to *inside*: And to take notice whether, during the whole time of the total Immersion, the inward Circle be every where continued, and of an uniform Figure. The less the said Diameter,

and the greater the Excess of the Moon's apparent Diameter above that of the Sun ; as also the greater the apparent Altitude of the Sun is above the Horizon ; the higher the Cause which produces the Crown must be, above the Surface of the Earth. And the Position, upon the Moon's Disk, in reference to the Zenith, of the Points of Contact, where the Sun disappears, or begins to shew itself again, is here also of some consideration. As to the accurate Calculation, it shall be given in another place.

VII. *Pars Epistolæ à Cl. D. Joh. Jac. Scheuchzer, M. D. Tigur. & Societat. Reg. Lond. Soc. ad D. Jacobum Petiver, dictæ Societ. Soc. de Eclipsi Solis totali Die 12^o. Maij Tiguri observatâ.*

Illustri Societati indica, habuisse nos die 12^o. Maij Eclipsin Solis totalem simul & annularem ; totalem, quoniam Sol integer à Lunâ fuit obiectus ; annularem autem non propriè ita dictam, sed per Refractionem, quandoquidem circa Lunam fulgor apparuit rutilans, à radiis per Atmosphæram Lunæ refractis ortus. *Vide Tab. 2.*

Initium Eclipsæ fuit mane horâ 8. 54'.

Medium horâ 9. 58'.

Finis horâ 11. 12'.

Mora mediæ & plenæ obscurationis 4'.

Quâ visæ fuerunt Stellæ tam fixæ, quam erraticæ ; ad nidos suos sese receperunt Aves ; prodire é latebris suis Vespertiliones, & Aquæ innatarunt Pisces : Nos autem experti sumus sensum frigoris manifestum ; & in Plantas cecidit Ros.

Tiguri d. 21. Maij, 1706.

VIII. A.

VIII. *An Account of the Death and Dissection of John Bayles, of Northampton, reputed to have been 130 years old. By Dr James Keill.*

John Bayles, the old Button-maker of *Northampton*, is commonly reputed to have been 130 years of age when he dyed. There is no Register so old in the Parish where he was Christened; but the oldest people, of which some are 100, others 90, and others above 80 years, remember him to have been old when they were young. Their accounts indeed differ much from one another, but all agree that he was at least 120 years. He himself did always affirm that he was at *Tilbury Camp*, and told several particulars about it; and if we allow him to have been but 12 years old then, he must have been 130 when he dyed.

He used constantly to walk to the Neighbouring Markets with his Buttons within these 12 years, but of late he has been decrepid, and carryed abroad. His Dyet was any thing he could get. I never heard he was more fond of one sort of Food than another, unless it was that about half a year before he dyed he longed for some Venison Pasty, but had it not. He dyed the 4th of April 1706. He lived in 3 Centuries, and in 7 Reigns.

His Body was extremely emaciated, and his Flesh feeling hard, the shape of all the External Muscles was plainly to be seen through the Skin.

The *Abdomen* being laid open, the whole *Viscera* appeared in good order, but more pale than they are commonly.

The *Omentum* was very small.

The Stomach was very much distended with Wind, and the Bottom of it wore extremely thin in that part which is next the Spleen, being hardly thicker than thin Writing Paper. In the inner Membrane there were no *Plicæ*.

The Liver was pale, but upon cutting was found perfectly sound. The Gall Bladder was of a larger size.

The Spleen was not so big as one of his Kidneys.

His Kidneys were firm and sound, as were all the Urinary Passages. In the Right Kidney were a few small yellow grains of Gravel.

The Intestines were all sound; the Mesentery was covered with Fat.

The *Cartilages* of the *Sternum* were not harder than usually they are. The Ribs were brittle, for by leaning gently upon one of them it broke.

The Lungs were attacked even to the *Pleura*: They were spongy, whitish, with many small black spots of Blood. The Cavity of the *Thorax* was large and clear.

The Heart was large, thick and fat; and tho he was always a little Man, yet the Diameter of the *Aorta*, before the *Carotidales* go off, was above two inches, which is considerably bigger than ever I remember to have seen.

The *Aorta* in the *Abdomen*, and *Illiacks*, was for the greatest part Cartilaginous.

The Bones of the Skull were found and good.

On the inside of the *Dura Mater*, by the *Falx*, was a small ossification.

The Brain was more firm and solid than usual, and in cutting, hardly moistened the sides of the Knife. The *Ventricles* were full of *Serum*. He had lost the use of his Eyes for some years; but his Hearing was good all
he

he dyed. His Genitals, both Testicles and *Penis*, were of a large size.

There is no doubt but that the weakness of his Stomach, and the hardness of the *Aorta*, were the Causes of his Death. The Coats of the Stomach were so thin, that they had not strength enough to keep out the Air, and consequently his Digestion must have been spoiled. He had not eat Meat for some years, and of late he lived only on Small Beer, Bread and Butter, and Sugars. And it was impossible that his Blood could circulate duly, whilst the great Artery, having lost its Elasticity, by being become Cartilaginous, could give no motion to the Blood. It is very probable that this was the Cause of his irregular and intermitting Pulse, which I have felt some years before he dyed. It is observable, that the greatest part of his Blood (which was in greater quantity than I expected) was contained in the Arteries, whereas generally in all dead Bodies the Veins are full, and the Arteries almost empty; for the Arteries being distended by the Blood, which they receive upon the last Systole of the Heart, by their natural Elasticity contract again, and empty themselves into the Veins, from whence it returns no more; but in this Man, the Great Artery having lost the power of contracting itself, it retained the Blood it received by the last Systole of the Heart.

This account agrees with that given of old *Parre* by the famous *Harvey* in most particulars, except in the Causes of their Deaths. But in both nothing seems more remarkably the effects of old age than the smallness of their *Spleens*, which undoubtedly was owing to the contraction of their Fibres in such a lax and spongy Bowel.

The whiteness of the Bowels in both must be likewise either from the same contraction or closeness of the Coats of the Blood Vessels, or from a want of Blood. *Harvey* says nothing of the quantity of Blood he found in old *Parre*;

Parre ; but if we may guess from his Body being fleshy, from the goodness of his Stomach and Appetite, and from the Disease he dyed of, there could be no want of Blood in him. In this Man there seemed to be more Blood than in several others I have seen, whose Bowels appeared more Red. And it can hardly be conceived, that the *Aorta* could be so large, without a large quantity of Blood, unless there had been some Stricture upon some other parts of it, which I did not perceive : And therefore it seems not improbable, that this whiteness of the Bowels was owing to the closeness of the Blood Vessels in both. It is no small confirmation of this opinion, that the Flesh and Skin felt hard, and the Brain firm and solid. I might add that it is highly probable, that the same disposition might give a closeness or hardness to the Vessels every where else. It is true, this was a Distemper, but then it is as true that it is a Disease of Old Age, and may justly be reckoned one of the effects of it. And for a farther proof of what I have said, I cannot but take notice, that in preparing a piece of the small Gut for an Injection, the *Tunica Villosa* felt more like a fine File than the softest Velvet ; and that I could use more violence in injecting the Vessels than these parts will usually bear. Whoever considers how soft a Substance an Animal Body is at its first beginning, and how from time to time it acquires a firmness and solidity, will easily be induced to believe, that Old Age brings a more than ordinary hardness to all the Fibres and Vessels.

The necessary consequence of this hardness, and contraction of the Fibres and Vessels of old people, is a diminution of their Secretions, which *ceteris paribus* are always proportional to the Orifices of the Glands. Hence it is that we find the Skin of old people always dry, their perspiration being very little. They are likewise generally bound, old *Bayles* went to Stool but once in ten or twelve days for some years ; and old people are always

com-

complaining of a want of moisture, not that the Radical Moisture is dried up, but because the natural Secretions, by reason of the contraction of the Glands, are diminished. I have already observed, that we found in this old Man more Blood than could have been expected in such an emaciated Body, and without doubt it had been larger, if his Stomach and Appetite had been as good as old Parre's. The fullness of the Vessels, and the frequent Rheums and Catarrhs of old People, evince this necessary consequence of the closeness of the Coats of the Vessels: All which agrees with what the Writers of *Institutions* say, that old Men are *ratione partium solidarum frigidi & sicci, ratione excrementorum frigidi & humidi*.

From this retention of the excrementitious parts of the Blood, we may expect all the ill consequences of a vitiated *Plthora*, and languid motion of the Blood; for the Fibres of the Arteries being now become hard, instead of assisting, they obstruct the Heart in circulating the Blood; and the quantity of Animal Spirits separated in the Glands of the Brain, must likewise be less, not only because of the retention of the Excrementitious Humours, but also because of the closeness and firmness of the Brain itself, so that the contractions of the Heart and all the Muscles must be weak, and consequently the motion of the Blood languid.

*Celidus tardante Senectæ
Sanguis hebet.*

A due conformation of all the Vital parts is most certainly necessary to bring a Man to a full old Age; but above all the rest, there are two which to me seem to have had the greatest share in procuring a Longevity to old Parre and Bayles, by retarding the ill effects just now mentioned. The first is the Heart, which in both was strong and fibrous; for that being left alone to labour
the

the circulation of a large quantity of sluggish Blood, a great strength is absolutely requisite to propel the Blood through unactive Vessels to the extremities of the Body, and back again. No doubt this is more easily done in Men of a low stature (as old *Bayles* was) which I am apt to think was a qualification of old Age. The second was the largeness of their Chests, and goodness of their Lungs, by which the Air had its full effort upon every Particle of the Blood, in rendring it florid and attenuating it, that it might easily move through the contracted Channels of an old Body.

Few have the happiness of such a Heart and Lungs, yet most men wish to live long; nor was it easy for Physicians to give Rules for preventing the ill consequences of extream old Age, whilst the effects of a long Circulation of the Blood were unknown; of which we can be certain only by Dissections of old persons, and these are not numerous enough to ground any thing certain upon. But if after Observations shall confirm the Remarks that have been now made, no doubt the Indication will be to preserve such a softness in all the Fibres, that they may easily yield to the pressure of the Blood, and by their Elasticity restore themselves to their former state, giving thereby a new *impetus* to the Blood.

IX. *The Construction and Properties of a new Quadratrix to the Hyperbola, By Mr . . . Perks. Communicated by Mr Abr. de Moivre, F. R. S.*

THE Circle, Ellipsis and Hyperbola being not Geometrically Quadrable (as infinite others) there have been two ways made use of to find their *Area's*. 1. By *Converging Series*, whereby Approaches are made nearer and nearer, according to the exactness desir'd: 2. By *Quadratics*, that is, Mechanical Curves, which determine the Length of certain Lines, whose Squares or Rectangles give the *Area* of the Figure desir'd: Of this sort is the old *Quadratrix* of Dinostratus, by which the Circle and Ellipse are squared; and another sort (for the same purpose) I inserted in the *Transactions* about 5 years ago. Since that, having found the Construction of a Curve, from whence (besides its own *Quadrature* and *Rectification*) the *Quadrature* of the *Hyperbola* is deriv'd, I thought the following Account might not (to some) be unacceptable.

Let A B, C D, be two straight Rulers joyned at B; and there making a right Angle. (Their length according to the largeness of the Figure you will describe.) E F is another Ruler somewhat longer than A B. Near the one end E, let a little *Wright-wheel* (represented edge-wise by *g b*, and made of a thin Plate of Brass or Iron) be fastned to the Ruler by a Pin (*i*,) thorow its Center, so that the Wheel may turn about upon the Pin (*i*) tight to the Ruler without joggling.

On the under side of this Rular (the side from the Eye in the Scheme) let there be pinn'd or glewed a little piece of Wood (in the form of a Quadrant, the part which is seen being mark'd kl), whose edge (or limb) kl , is an arch of a Circle of Center (i), and Radius ib (the same with the little Wheel). The design of this piece of Wood is, that in the several Positions of the Rular EF , the circular Limb kl always touching and sliding by the edge of the Rular AB , the Center of the Wheel may be always in a line (im) parallel to the Rular AB .

In the Rular CD make $MB = ib$ or ik , and at M fasten a little Pin, and another to the Rular EF near the Wheel, as at p . To these two Pins let be fastened the two ends of a String MR , so that its whole length (from Pin to Pin) $+ pi$, be equal to the intended Axis of the Curve TW .

The Instrum^t being thus prepar'd, let a strong Rular SO , be fasten'd (or held fast) upon the Paper or Plain where the Curve is to be drawn upon. Lay the Rular EF from M towards A , and parallel to AB , so that the String lies all straight along the edge of the Rular EF from M to p , the point Sk of the Quadrantal piece of Wood resting upon the edge of the Rular AB . Then with a small Pin at M keeping the String close to the edge of the Rular EF , and with your other hand upon the end E , keeping the Wheel tight to the Paper or Plain, move the Pin, String and Rular EF from M towards O , the Rular CD sliding along by the fasten'd Rular SO in a right line, the Wheel kl will by its motion describe the desired Curve TV .

Note,

Note, The Semi-diameter of the little Wheel must be about the *Sum* of the thicknesses of the two Rulers EF and AB, that it may touch the Paper. Also it will be convenient that its edge be thin, and a little rough, that it may not slide flat-ways, and that it may leave a visible impression.

From this Construction the following Properties are demonstrable.

I. It is evident from the Construction, that the *Sum* of the *Tangent* and *Subtangent* is every where equal to the same given Line = $MR + Ri = TW$. (for the String (first straight at TW, afterwards making an Angle at R) being every where the same, the Line Ri (or Rp + pi) is always the Tangent, and the Remainder RM the Subtangent; the Contact of the Wheel with the Plain, being the point of the Curve to which they belong.

II. It hence follows, that any assignable part of the Curve is *Rectifiable*, or equal to any assignable straight Line. In Fig. 2. Let FAE be a part of the Curve, its Vertex F. HDd is the Line described by the motion of the Pin R (in Fig. 1.) and may be shewn to be Asymptote to the Curve. FH a perpendicular to HD. Let A be given point in the Curve, AD the Tangent, and BD the Subtangent to the same point A. Let a be another point in the Curve infinitely near to A. to which let ad be the Tangent, and bd the Subtangent. Draw AG, ag perpendicular to FH and AB, ab perpendicular to HD. By the Construction $AD + DB = ad + db$. Let a be made equal to AD, and draw Dd. Then because $ad + db = AD + DB$. Subtract bD and aD (or a d) from both Sums (Equals from Equals) there remains $dD + dD = Aa + Bb$ (or Ca) AaC,

Dd & are like Triangles (or differing infinitely little from each) therefore $C a (E b) : A a :: d d : D d$. and compounding $B b + A a : A a :: d d + D d : D d$. Alternating $B b + A a : d d + D d :: A a : D d$. But $B b + A a = d d + D d$ (as is shewn above) therefore $A a = D d$. $A a$ is the fluxional Particle of the Curve $F A$, and $D d$ is the fluxional Particle of the Line $H D$: These Fluxions or Augments, being equal, and their flowing quantities beginning together, are themselves therefore equal, *viz.* $F A = H D$.

Let $F G = x$. $G A (= H B) = y$. $A D = t$. $B D = S$. So is the Curve $F A = H D = y + S$: that is, *the Curve from the Vertex to any given point therein, is equal to the Sum of its Ordinate, and Subtangent to the same point which is its second Property.*

III. The next Property (and whereupon I call it the *Hyperbolic Quadratrix*) is this, In Fig. 2, let $F A E$ be a part of the Curve, (&c. as before.) $E I K H$ is a Square upon the line $F H$. $A I L$ is an Equilateral Hyperbola whose Vertex is I , its Asymptotes $H O, H R$. its Ax $H I$. From a given point L in the Hyperbola (below its Vertex I) draw $L A$ parallel to the Asymptote $R H$, intersecting the Diagonal $I H$ in M , $F H$ in G , and touching the Quadratrix in A . I say, that the Hyperbolic Area $I L M$ is equal to a Rectangle, whose sides are the Ordinate $G A$, and twice $F H$, the Ax to the Quadratrix, that is, $Trilin. I L M = 2 F H \times G A$.

Let $F H = a$, $E O = x$, $O A = y$. Because of the Hyperbola $GL \times GH (L I) = F H q$. therefore $GL = \frac{F H q}{GH}$; and $LM = \frac{F H q}{GH} - G H (M O)$ that is,

$$LM = \frac{a a'}{a - x} - a + x = \frac{2 a x - x x}{a - x}, \text{ and consequently}$$

the fluxion of the Area $I L M = \frac{2 a x - x x}{a - x} x$

In the Rectangle triangle A D B, A B = a - x, B D = S, A D = t = a - S; then is A D q = A B q + B D q: or $a a - 2 a S + S S = a a - 2 a x + x x + S S$, which being reduced, gives $S = \frac{2 a x - x x}{2 a}$

Let I a be a right line supposed infinitely near and parallel to L A, and intersecting A B in C. Because of like triangles A C I, A B D; A B : B D :: A C : C a that is $a - x : S (= \frac{2 a x - x x}{2 a}) :: x : \dot{y}$. therefore $\dot{y} =$

$\frac{2 a x - x x}{2 a a - 2 a x} \dot{x}$. Multiply each by 2 a, and 'tis $2 a \dot{y} =$

$\frac{2 a x - x x}{a - x} \dot{x}$. The *Flowing quantity* of $2 a \dot{y}$ is $2 a \dot{y}$

and the *flowing quantity* of $\frac{2 a x - x x}{a - x} \dot{x}$ is the Hyperbolic

Area I L M (as is shewn before.) These two Area's beginning together at F and I, and having every where equal *Fluxions*, or Augments, are therefore themselves every where equal.

N. The Quadrature of the Trilinear Figure LLM being thus found, any other Area bounded with the Curve line I L. and any other Right Lines is also given.

IV. Supposing the same things as in the precedent Proposition, I say, that the Area of the Quadratrix F a b H F is equal to half the square of F g, wanting the Cube of

F g divided by six F H, or $F a b H F = \frac{x x - x x x}{x \cdot 6 a}$. The

Fluxion of this Area is the Rectangle C a b B = $a - x \dot{x}$
 $= a - x x \frac{2 a x - x x}{2 a a - 2 a x} \dot{x} = x \dot{x} - \frac{x x}{2 a} \dot{x}$. The

flowing quantity of $x \dot{x}$ is $\frac{1}{2} \dot{x} x$: And the flowing quantity

tity of $\frac{x x}{2 a}$ is $\frac{x x x}{6 a}$ [as is easily shewn by bring-
 ing back these flowing quantities to their respective Fluxi-
 ons.] And hence also it follows, that the whole Area
 continued on infinitely towards F , is *one third of the*
Square F I K H; or $\frac{1}{3} a a$. For supposing $x = a$ the Area
 above becomes $\frac{a a}{2} - \frac{a a}{6} = \frac{a a}{3}$.

While I was considering the other Properties of this
 Curve, and had given some account of them to my
 Ingenious Friend Mr *John Colson*, he returned me
 a Letter with the Addition of the Quadrature of
 the Curves Area, which I had not then enquired
 into:

V. Supposing still the same things, I say that the Solid
 made by the conversion of the Area $F a b H F$ about the
 Line $H b$ as an Axis, is equal to a Cylinder whose Radius
 is $F H = a$, and height equal to $\frac{x x}{2 a} - \frac{x^3}{2 a a} + \frac{x^4}{8 a^3}$.
 And the whole Solid made by conversion of the whole
 Figure infinitely continued, is equal to an eighth part of
 a Cylinder, whose Radius and Height are each equal to
 $F H$ or a .

Let $\frac{P}{D}$ express the Proportion of the Periforic and
 Diameter of a Circle. Then is $\frac{P}{D} a b$ quad. the Area of
 a Circle whose Radius is $a b$. And because $C a = y =$
 $\frac{x}{2 a} - \frac{x^3}{2 a a}$ the fluxion of the Solid is $\frac{P}{D} a b \frac{d}{d x} \left(\frac{x}{2 a} - \frac{x^3}{2 a a} \right)$
 or

$$\text{or } \frac{P}{D} a - x^2 \cdot \frac{x - \frac{x x'}{2}}{a - x} = \frac{P}{D} a x - \frac{1}{2} x^2 + \frac{1}{2a} x^3$$

whose flowing quantity is $\frac{P}{D} a x x - \frac{x^2 x}{2} + \frac{x^3 x}{2a} +$

$\frac{x^4}{8a}$. Which Solid being divided by $\frac{P}{D} a a$ (the Area

of a Circle whose Radius is a) gives $\frac{x x'}{2a} - \frac{x x x'}{2aa} + \frac{x^4}{8aa}$

for the height of a Cylinder on the said circular Base, and equal to the Solid made by conversion of the Area $F a b H F$ about the Line $H b$ as an Axis. When $x = a$ (that is when the whole Figure is turn'd about its Asymptote) the height $\frac{x x}{2a} - \frac{x^3}{2aa} + \frac{x^4}{8aa}$ become $\frac{1}{8} a$.

VI. The Curve surface of the Solid generated by the Conversion of the Figure $F a b H F$ about $H B$, is equal to the Curve surface of a Cylinder whose Radius is a , and height equal to $\frac{x}{2} - \frac{x x}{4a} + \frac{x x x}{12aa}$. And the whole Curve Surface of the Solid infinitely continued, is equal to one third part of the Curve Surface of a Cylinder whose Radius and Height are equal to $F H$ or a . Which may be demonstrated after the manner of the preceding Proposition.

VII. The Radius of the Curvature of any Particle of the Quadratrix is $\frac{a^2}{a - x}$ and this found Geometrically.

In Fig. 3. $F A E$ is the Quadratrix, $H D$ the Asymptote, $A D$ the Tangent, $E D$ the Subtangent to a given point A . Make $B V = A D$. Upon V the perpendicular $V W$. from A draw $A W$ perpendicular to the Tangent $A D$, till it

it meet A W in W. So is A W the Radius of the Curvature at A.

VIII. This Curve may be continued on infinitely above the point F (but by a different and more operose way of Construction) whose Properties will be these. 1. The *Difference* of its Tangent and Subtangent (taking the Subtangent in the Line H S) will be always equal to the same given Line F H or a . That is, as $t + s = a$, below F, so $t - s = a$ above F. 2. As below F the Curve Line is equal to the *Sum* of its Ordinate and Subtangent, so above, it is equal to their *Difference* or $-S - y$. 3. As below F, $2ay = ILM$, so above $2ay = I\lambda\mu$. All which (and its other Properties) may be demonstrated as the Precedent *mutatis mutandis*.

IX. With a little variation in the precedent Construction may the *Logarithmick Curve* be constructed, which is also a *Quadratrix* to the Hyperbola. In Fig. 10, omitting the String M R P, let the distance M R be equal to the *Subtangent* of the intended Logarithmick Curve (which, as 'tis known, is invariable.) Stick a Pin at R in the Ruler C D, to which apply the Ruler E F, so that the edge of the little Quadrant $k l$, resting upon the Ruler A B, the distance M i be equal to M R. Then keeping the Ruler E F tight to the Pin R and Ruler A B, slide the Ruler C D along in a straight Line (by the Ruler or Line S O.) So will the Wheel $g h$ describe a part of the Logarithmick Curve T V, whose *Subtangent* is every where M R.

X. Fig. 2. Let F A E represent the *Logarithmick Curve*, whose *Subtangent* is equal to F H. L I A is an Equilateral Hyperbola (&c. as before § II.). Let F G = a , G H = b , F H (= B D) = a , G H (= L S) = b , A C = y . Then A C : C a :: A B : B D, that is $x : y :: a$

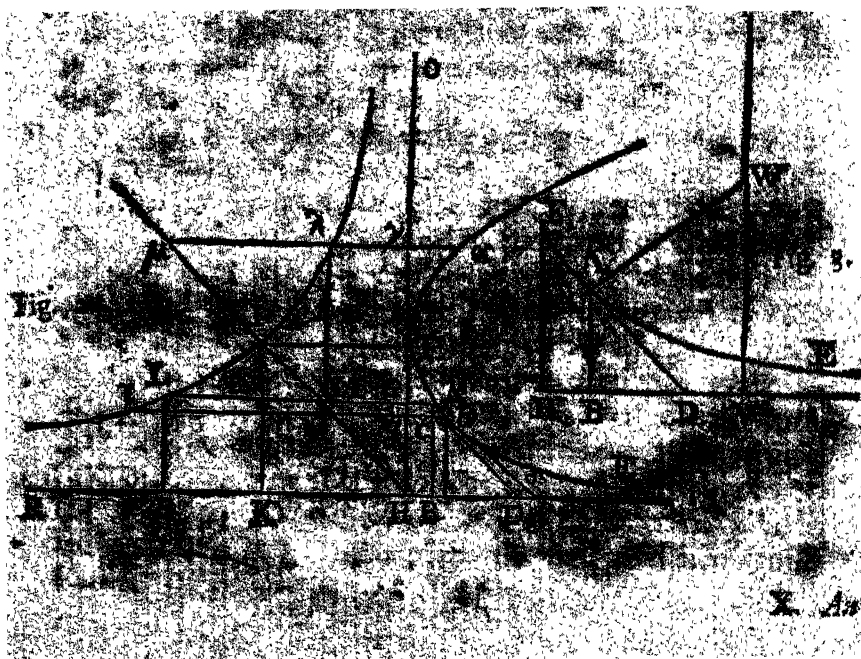
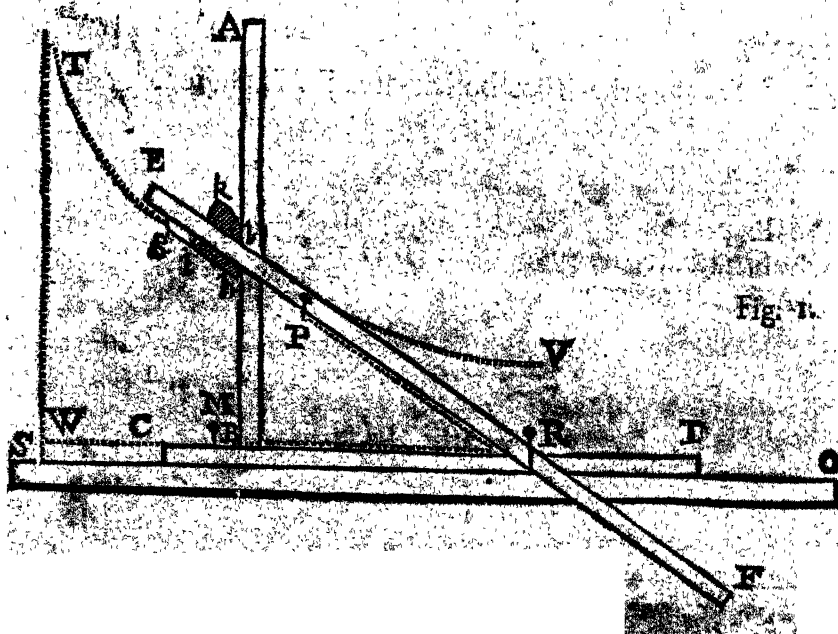
$x : a :: a : \frac{a a}{a - x}$. therefore $a \dot{y} = \frac{a a}{a - x} \dot{x}$. The

Flowing quantity of $a \dot{y}$ is $a \dot{y}$ and the *Flowing quantity* of $\frac{a a}{a - x} \dot{x}$ is the Hyperbolick Area $FILG$ (for by the

nature of the Hyperbola $GL = \frac{a a}{a - x}$) therefore is

the Hyperbolick Area $FILG$ equal to $a \dot{y}$, a Rectangle whose sides are the Subtangent ($BD = FH$) and Ordinate GA (as here accounted) of the Logarithmick Curve.

(2262)



An Account of a Book, Entituled

- * X. Samuelis Dale *Pharmacologie seu Manuductionis ad Materiam Medicam Supplementum: Medicamenta Officinalia simplicia, priore Libro omissa, complectens: Ut & Notas Generum Characteristicas, Specierum Synonyma, Differentias, & Vires. Cum duplici Indice, generali altero Nominum & Synonymarum precipuorum, altero Anglo-Latino, in gratiam Tyronum.*

IN the year 1693 our Author published his *Pharmacologia seu Manuductio ad Materiam Medicam*, of which an Account was given in these *Transactions*, (*viz.*) N. 204. pag. 929. After the publishing of which, he observed an Increase of the *Materia Medica*, many Medicinal Simples being used in the Shops, and likewise he met with several Books relating thereto, which either were not then published, or had not come to his knowledge before. And our Author having also received advice from divers Ingenious persons, who had travelled into Foreign Countries, that his aforesaid Book was well received, not only in *France* and *Holland*, but likewise in *Italy* and the remote parts of *Germany*, made him think a Supplement necessary to render it more useful to other Countries. And because it has extended its progress to the Neighbourhood of *China*, that ancient Fountain of Learning, he concluded, that it would not be improper to add out of *Dioscorides* and the Foreign Dispensaries, all those things which he had omitted publishing: And that in a

Book by themselves, without staying for the reprinting of the former Book.

Our Author had made a considerable Progress in his design, when he received advice that Monsieur *Tournefort* was, by the *French Kings Order*, gone into *Greece* and the adjacent Islands, in search of Plants, especially those of *Dioscorides*; this occasioned him to stop the prosecution of his Work for some years, in hopes that great and accurate Botanist would upon his return gratifie the Curious with his Discoveries of the true and genuine Plants of the Ancient *Grecians*, which had perplexed the Herbarists of our late Ages.

In this Supplement our Author took care to set the *Materia Medica* of *Dioscorides* in a clear light; and for that end consulted all the Authors that he could meet with upon that subject, keeping as close as he could to his Text, in which he chiefly adhered to the Translation and Commentary of *Libanius*. And because in this performance he travelled in an untrod den path, knowing of no precedent in any Language, he therefore consulted both the Dead and Living, (*i. e.*) not only Books, but many Persons of Ingenuity and Learning. The nature of the Work requiring the Virtues of each Simple to be annexed, and the design of the Book requiring Brevity, he chose to transcribe them from Authors, which had already contracted to his hands; and at the same time, to avoid the mistakes of *Page 10*, he altho' it was necessary to insert the Name of the Person from whom he took it any discredit to him, that he was not the Author, but rather a Copyist, and this he did throughout the Work acknowledging the Persons to whom he was indebted from.

This Book being only a Supplement to the former Work, as before, is divided according to the same Method, and therefore need not here to repeat what has been already said.

give a short account of some things in the Work it self. In the first Book of which, our Author in the Chapter of Waters takes notice, that *Cold Baths* were in use among the Ancients in the Cure of many Diseases; and that they are commended by divers Learned Physicians, and especially by Sir *John Floyer*, Kt. and *Dr Baynard*; the first of which, in his Excellent *Pyrexologia*, hath enumerated the several sorts of Cold-Baths, and the many Cures performed by them. He likewise takes notice of the divers ways of making *Salt* from *Sea-Water*; first by insolation only, as *Bay Salt*, the Sea-Water being in hot Countries grained in Pans called *Salt-Marshes*; 2dly, partly by the Sun, and partly by Fire, as *Port-Salt* at *Limington* in *Hampshire*; 3dly, by Boiling only, as *Newcastle* and *Salterns*; and 4thly, the manner of making *Salt* from *Wells* in *Lincolnshire* and other places; and he also observes, that both *Speed* and *Gardner* take notice of the Evaporation of Sea Water into Salt, by the Sun, in the hollows of certain Stones in the Bishoprick of *Durham*.

In the Chapter of Mineral Waters, he takes notice of their several divisions and sorts made by his Neighbor Mr. Allen. In his Book of the *Chyliferous and Purging Waters*, he sheweth that in the Chapter of *Salts*, besides many other Names, there is the Certificate of Salt, *Sel. Germanicum Album*, and *Sel. Germanicum Rubrum*, which are the *English* *Whitish* and *Reddish* Salts, as his Learned Friend Dr. Boerhaave saith. He takes notice of a sort of Salt made at *St. Asaph*, which he saith is *Sulphur Salt*, by the dissolving *Rock* and *Stones* in Sea Water.

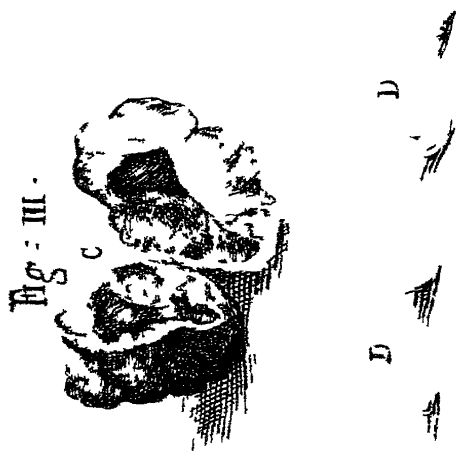
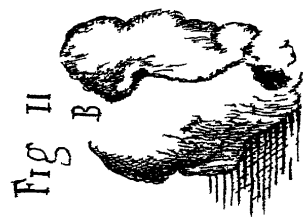
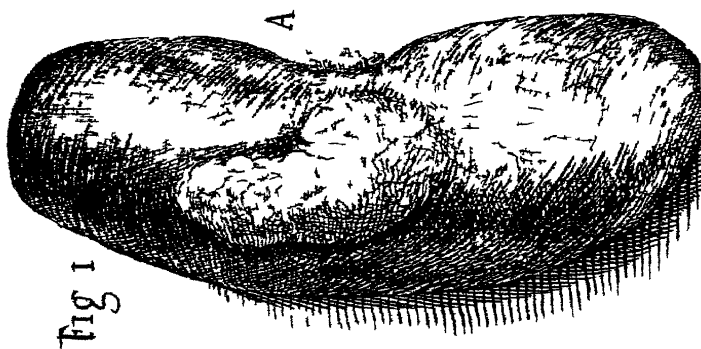
In the C... ..
the Advice
... ..
to be with
... ..

In the 2d Book our Author shews that the *Paco Sem-
pie*, or *Golden Moss*, of *Dr Grew*, so celebrated in an
Hæmoptysis, is only the Down of the Root of a sort of
Fern, growing in *Tartary* or *China*; which Root he con-
jectures to be the *Agnus Scythicum*, of which Authors
write so many Fabulous Stories. He ennumerates the
many Controversies among Botanick Authors about
Wormseed, concluding it to be the Seed of a sort of
Wormwood. The famous *Cylonian Plant* against Deafness,
of *Mr Marlow*, he affirms to be a sort of Mint; *Ipecacu-
anha* to be the Root of an *American Herb*, near a kind
to the *Herba Paris*: *Anisum Judicum* to be the Seed-
Vessel of a sort of *Fraxinella*. The *Star of the Earth*,
(so call'd,) in a famous Receipt against the biting of
Mad-Dogs, he proves to be the *Coronopus*, and not the
Sesamoides Salamanticum Magnum, which some mistake it
for. *Soia*, of which *Ketchup* is made, is the Seed of an
Indian Phaseolus; as *Angola Seeds* are those of an *Abrus*,
and *Russia Seed* of the *Gramen Manna*. *Salep*, *Cassum-
muniar* and *Dart wort*, are 3 Roots; the first of a sort of
Orchis, the second of a Species of *Galanga*, and the last
of an *Indian Reed*.

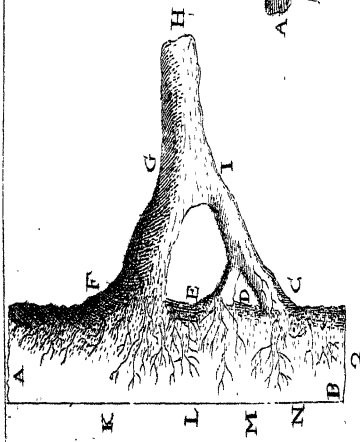
In the *Dendrology* our Author demonstrates *Palm-Oyl*
to be made of the Fruit of an *African Palm-tree*: *Mal-
diva*, and *Malabar-Nuts* to be likewise the Fruits of two
Indian Palms, as *Sage* is the *juice* of the *Patch* of ano-
ther *Palm* granulated. He observes the various sorts of
Dragon's Blood now to be found in the Shops, and gives
a farther account of the Tree which yields the famous
Peruvian Bark. He acquaints us what Trees or Shrubs
they are which do produce the *Simples* published by the
late *Mr Marlow*, under the feigned titles of *Virginia* and
Molucca Nuts, *Bengala Beans* and *Bermudo's Bayne*, *Cas-
sina*, and *Perygua*. The *Faba Sancti Iacobi* is proved to
be a sort of *Nutmeg*.

In the third and last Book, our Author gives some farther account of the *Cochinle*, proving it to be of animal production, and that it is not any of *Englisb L. dy-com*, as some have affirm'd : The *Glossopetra* he believes to be the petrified Teeth of Sharks. Concerning the *Serpentine stone*, he takes notice of the difference in Authors about it, *viz.* whether it is a Natural or Artificial production, and whether it hath the Virtue to expel Poison in Venemous bites or not? He enumerates the several assertions of the Learned *pro & con*, quoting divers of their Experiments, and at last concludes, that both Natural and Artificial are to be met with, and that the different operations must arise from thence. *Pedro del porco* our Author affirms to be only an *Aegagropila* found in the Stomach of a Porcupine. To these he adds some Observations taken from *F. Camilli* his Papers, not only concerning this Stone, but likewise *Bezoar*. The whole Book abounds with many Curious Observations, for the farther dilucidation of the *Materia Medica*, which we recommend to the perusal of the Curious.

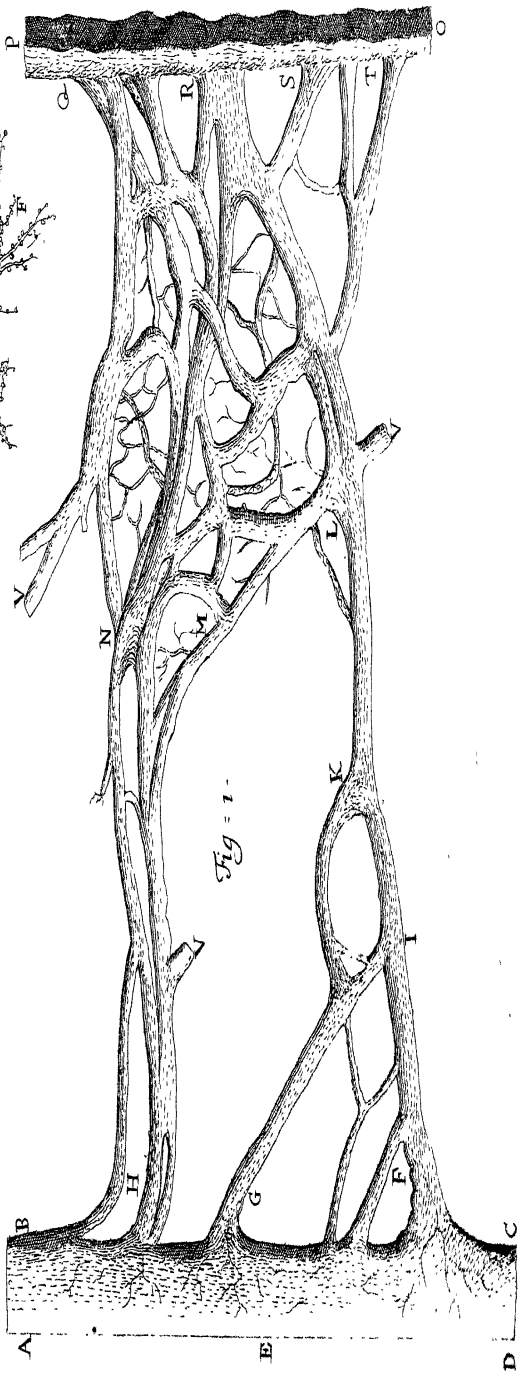
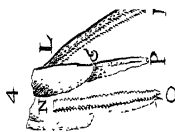
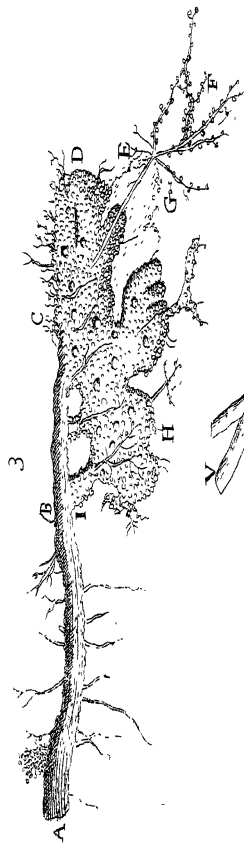
London, Printed for Sam. Smith and Benj. Walford Printers
at the Royal Society, at the Prince's Arms in St Paul's
Church-yard, 1706.



Tab 1



Tab. 2 -



PHILOSOPHICAL TRANSACTIONS.

For the Months of July, August and September, 1706.

The CONTENTS.

- I. *De Monstris, quasi Monstris & Monstrosis; item de Serpentibus, &c. Philippensibus, ex MS. R. P. Geo. Jos. Camelli. Communicavit D. Jac. Petiver. Pharmacop. Lond. & S. R. S.*
- II. *An Account of an Experiment made before the Royal Society at Gresham College, together with a Repetition of the same, touching the Production of a Considerable Light upon a slight Attrition of the Hands on a Glass Globe Exhausted of its Air: With other Remarkable Occurrences. By Mr Fra. Hauksbee, F. R. S.*
- III. *A Letter from Mr Samuel Dale to Dr Hans Sloane, R. S. Secr. giving an Account of what Manuscripts were left by the Reverend Mr John Ray, together with some Anatomical Observations made at Padua by the said Mr Ray.*
- IV. *Of Hydatides inclosed with a Stony Crust in the Kidney of a Sheep. By Mr W. Cowper, F. R. S.*
- V. *Microscopical Observations on the Structure of the Spleen, and the Proboscis of a Flea. By Mr Anthony Van Leeuwenhoek, F. R. S.*

I. *De Menstruis, quasi Monstris & Monstrosis ut in de Serpentibus, &c. Phlippensibus, ex Mss. R. P. Geo. Jos. Camelli. Communicavit D. Jac. Petiver. Pharmacop. Lond. & S. R. S.*

1. **I**ndi *Abayin* Uxor enixa est puerum A. D. 1695. in Vico *Palo* Insulæ *Carigara Byssiarum*, facie *Iestudinis Marine*, & testæ ejusdem testellis in cute expressis: Anno verò insequenti alterum similem dedit.

2. *D. Maria Quiros* enixa est *Mariam* post duodecimum, *Josepham* post decimum tertium, *Isaannem* post decimum quartum mensem, qui natus est bino dente. *Manila.*

3. *D. Elizabetha Cuviana*, Gravida quotiescunque, me struabat ac si nato non pareret, nullo si tempore gestationis sanguis non mitebatur, inflata & tumens suffocabatur, & moribus pedibusque ex plethora paralytica fiebat, & denique abiebat. Proles verò non obstante fluxu menstruo, & sanguinis missione enixa est 12, 13 & 14 mense, quadrato, & bene conformato. *Manila.*

4. Uxor *D. P. Montenegro* enixa est puellum coloris *Æthiopis*; oblectrix prudens suspicata melioris, aut piceæ præcedentis effectum, rogavit num clapsis diebus, liquid appetitum quod non concessum fuerit, & certior facta appetitum antea peritum *Sardinis*, quas in ejus conspectu *Æthiopissa* cachabat, tulit de *Sardinis* ossa & reliquas, & puellulo os retribuit, & sine morâ color adultus in candidulum transmutatus est. Hic diem ætatis virilis, ex vehementi animi pulsione & conflictu, unica nocte omnino incanuit. *Manila.*

5. *Pueros* tres vivos peperit uno partu in Suburbio s. Crucis A. D. 2699 *Sino-Inda*.

6. *Arbiter* tres vivos peperit uno partu & *Æthiopis*: Ana A. D. 1692. *Taybaliqne*.

Mostra quæ exstebant A. D. 1700. in *Insula Catanduan*.

7. *Joannes de Flores*, Vir cæterum bene formatus, monstruosa habet *Brachia*, quæ vix non crassitudinis sunt *Femoris*, Manus verò digitis ferme triplo longiores ordinarijs, in quibus tres digiti medijs coa'uere.

8. *Martinus Sumiga* Pater a nativitate mutus, laborans antipathia *Auri*, ad cuius præsentiam miserrimè convulsionibus torquetur, ad inaurata verò non patitur.

9. *Puella*, cui *Mammarum* loco propendent genua usque duo quasi carnea forcimina, æqualia ab exortu usque ad extremum.

10. *Martina*, Puella ventriloqua, sentit interne sapientissimè quod nec se ostendere valet, & tunc immota illa, vox interna distincta, & tenuis, loquitur & respondet varijs linguis. *Demon* illuter esse videtur, sacris exorcismis non parit, seras recitat Orationes, illa ipsa vox interna. Puellæ non est damno; futura, & ignota, alia prædicat, alia nescit.

11. *Pucca Hermaphrodita* Indis *Talos* Homines androgynos *Pinabaye* vocant & *Binoje*.

12. *Vitulus* domi D. *Francisci de Quiros* natus unicoloris: Cornu est Bovinum, sed rectum de medio frontis exiens: Facies nec bene Vituli, nec bene Humuli. *Liquor* vero *Insula* non alit.

13. *Allinan*, Hispanis *Albinno*, vidi *Manila*: erat Puella decennis (proles *Morenarum* parentum, qui coloris sunt fuliginosi, sed capillitio procerbo) albedinis extraordinariæ & insolitæ in admirationem trahentis, & monstruosæ, capilli anreoli, solem ac lucem invitè ferens. Causam vulgus non phantasie sed Lunæ influxui tribuit.

14. In *Mindoro* Insula vico *Camaron* Nigrita primo partu enixa est puerum unum, secundo geminos, tertio nigerrimos, & ante A.D. 1700. utero gerit.

15. *Homines cautos* reperiri ferunt in Mediterraneis *Paganis*.

Ex Historia *Bysaiarum* MS. Ignatij Alzinæ.

16. In Vico *Tubig* Provinciæ *Pictorum*, Uxor Indi *Patolon*, eodem partu post enixam puellam, peperit & *Crocodilum*, longitudinis orbitalis, quem maritus recisa caudæ parte in fluvium projecit; hic dein ferme omni nocte fluvium egressus sub domum veniebat, unò transmigrando post biennium in alium vicum distantem duobus milliariis, uterinam Sororem Frater *Crocodilus* sequutus fuit. Tandem Sororem fugientem ab invito Fratre n octo Milliaribus distantem vicum *Borongam* frater sequutus est; post 31 annum verò adhuc vivebat uterque, imo multoties *Apros*, *Cervos*, *Testudines Marinas*, aut *Pisces* majores Sorori noctu ad domum deferrebat. Ign. Alzina Lib. 1. cap. 9. H. Byf. MS. In vico *Calviga* Provinciæ *Bysaiarum*, Inda enixo puero sano & bene disposito enixa est & *Serpentem*, longitudinis sesquipalmaris, crassitie digitalis, rubrum a capite ad medium, a medio usque in caudam nigrum, squamis relucentibus, qui pro tunc defugit, & latuit; die verò tertiâ, & postea multoties inventus fuit ad latus Pueri, ita ut mater coacta fuerit aliò transmigrare, ut puerum à persecutore fratre Serpente liberaret. J. Alz. l. 3. c. 12. MS.

18. Gigantes *Tuia* vocant; extitisse in *Igbabaa*, cum Uxore & Filiis, nomine *Merongboronga*, constans est fama.

19. Alium in *Gimasava*, nomine *Pusung*.

20. Gigantum tibie inventæ fuere in *Bulilacu*, circumferentiæ duarum spithamarum, longitudinis Orgyialis.

21. Existere in hodiernum in montibus Moluccensis *Caraga*, & in insulis jacentibus contra caput *Santi Jacobi* ubi visi sunt. In montibus *Gigantum* inter *Et Borongan* inventa sunt vestigia pedum triplo majora hominis ordinarij.

22. *Pygmeos* non Monstruosos sed benè formatos vocant *Bongan* & *Malypoto*. Ili cubitales interire Gigantem *Pusung* in *Caloiga*.

23. Circa vicum *Bistie*, Insulæ *Malanao* venatores invenerunt Puellam spithameam, vagrantem, benè dispositam, quæ baptizata die tertiâ expiravit. Visi sunt sæpius in desertis & ab alijs non inhabitatis Insulis *Siargao* & *Asargao*.

24. *Pygmeos* defectuosos, seu Monstruosos vocant *Aluti Suman* & *Pandacan*, Hispani *Emanos*. Maglono *Pambuanus*. Altitudinis erat quinque spithameæ, benè proportionatus, verum Monstruosè quadratus. Balico *Tambucensis* ejusdem staturæ, improporcionatus, sed robustus & magnarum virium.

25. *Dulacensis* corpore pueri Sexennis, gracilis vixit annis 40, *Manila*. Ubi nunc mas unus, & duæ feminae.

26. In colonia *Panayensi* ex parentibus *Indis*, staturæ proportionatæ nata & baptizata est Anno 1685. Pigmea nomine *Anna*, non monstruosa, sed benè conformata & & proportionata quæ Anno præsentis 1703 vivit & altitudinis est palmi unius & trium digitorum, loquitur, & omnes rationales obit functiones, vivit cremare *Oryzæ* cui cum habetur additur Semen *Cucurbitæ*. Prior *Panayensis* R. P. *Josephus Trepad* parentes unâ cum Pigmea filia proxime *Manilam* deducere tentaverat, sed hac de causa sublevata Provincia ferè hostiliter restitit, Parentes verò cum filia in montes profûgere, ubi in hodiernum cum *Indis* necdum reductis degunt, & quo Hispani hocce Naturæ miraculum videndi gratia sese conferunt. Hæc ex relatione *Emanuelis Rodriguez de Leon* qui supradicto P. Priori *Panayensi* convixerat.

27. *Indus* viginti quatuor digitorum.
 28. *Indus* alius, cignis catus, habens eos in Pedibus.
 29. *Indus* alius, carens digitis in Pedibus habens eos in Manibus.
 30. *Indus* alius, excepto pollice, reliquos habet concitos.

31. *Catao* Monstrum est Marinum Tritonium, formæ *Hominis*, quorum unum Mortuum inventum fuit Masculum. Voces vero, & Ejulatus eorum sæpius audiuntur, & ipsa non raro visuntur circa Insulam *Dinacut*, qui inter *Leyte* & *Mindanao* sita est, ex vestigiis luto impressis, & emortui forma constat inter divaricatos Manuum, & pedum digitos Membras habere *Anaturus* modo.

32. *Ognima* & *Talonganum*, Indi vocant Monstra Figuræ humanæ pilosa, fera & terrificæ. Visa sunt ut refert *Alphonsus de Mentrída* Anno 1599. & 1600. multa, in montibus *Province Tbahay* & *Aclan*, formæ Satyrorum, Faunorum & Silenorum.

33. *Onglo* & *Tigbalan*, Nescio quid Spectri, formæ *Ethiopis*, staturæ *Gigantæ*, muties puellas & pueros in *Deserta* abducens. Qui reduces, vel casu inventi, quasi terrore panico perculsi ad omnia stupent, & attoniti hærent.

34. *Additamentum in adnotationes* de Monstris quæ sibi Anno clauso Mens. Octobri misi.

35. Monstrum *Philippense* Centauri facie **GAZ. NAT.**
Tab. 45. fig. 4.

Monstrum *Catbaloganum*, enixa est Mulier *Tinampay* vocata, Anno 1678. Vixit circiter horæ quadrantem, & extinctum est. Multiforme erat & terribilis visu formæ: *Rostrum* erat quasi *Ardeæ*; *Vultus* & *Aures Cervi*, *Collum* longum *Cervinum* & pilorum loro setis *Equinæ*, hirsutum, *Dorsum* & *Pectus* & reliquæ usque in *lumbos* *Hominis* erant, sed confitis plumis varium cogniturum *Avium*; *Brachia* & *Manus* prouti & *crura* trium juncturarum, digiti

Ma-

Manuum *Cercopitheci*, unguium *Felis*, aut *Filicis*. & digros inter, Membranæ intergerminæ ut patuit *Sauri*, Nates conchæ Testudinis Marinae modo in aëre latevæ: Formosa & crura Cervina in bisulca unguis deficiente, verum pilo vario, variorum Animalium ut Equi, Vaccae, Cervi, Felis, Canis, Simiae, Muris Vespertilionis & aliorum, quas interpolatim r sarcita. Communicavit *Franciscus de la Zarza* qui vivum vidit eadem confirmat *D. Franciscus de Alzaga*, qui eo tempore illam provinciam administrabat, & mortuum vidit. Addendo *Indum* ex quo dicta Mulier conceperat fuisse Magum.

36. *Manila* Anno 1693. in domo *Joannis de Mena*, Scropha peperit nephrendem cui aures majores Equinae, vultus lepidus, ridiculae vetulae, naves in longam *Elephantinam* proboscidem protensa.

37. Puer *Baclayonensis* Boholanus Anno 1700. Octennis erat, Gigas futurus, si infantiam, & corporis proportionem, & vires spectamus. Triennis siquidem uno prandio 4 & 5 lagenas *Tubæ* ebibebat, Succus est Jucoso vinosus *Nucis Indicae Cocci*, & tantum radicis *Ube* assæ, aut coctæ, est species hujatis *Buteæ*, edebat, quantum senis robustis *Indis* dapiliter sufficeret. Vires proportioni corporis, & copiae nutrimenti correspondent, jocando etenim & ludendo domus Indorum tametsi columnationis fortissimarum arborum, nutare & contremiscere facit. Scripsit *F. Antonius de la Zarza*, qui puerum vidit.

38. *Draco cristatus*, alatus tetrapus. GAZ. NAT. Tab. 85. Fig. cum Anno 1703. 23 Martii cum *R. P. Joachymo Affin*, & aliis circiter 20 itineris Sociis per æthuariam *Panayense*, Capis versus vehremur, obvium habuimus in ipso æthuario littore saxo incumbentem Draconem formæ sequentis, Longitudinis erat prope Orgyialis, altitudinis unâ cum pedibus & spinæ dorsii crista duobus dodrantibus majoris, crassitudinis tæmore amplioris. Caput habebat *Leoninum*, album oculorum coloris xerampelini, iridem

fulphuream, pupillam aterrimam; *Labium* inferius flavo-palliescens, supernum lutescens: *Fauces* tingentes duobus caudicantium dentium ordinibus stipatas, *Linguam* rubentem. *Pectus* erat amplum, & corpore torosius: *Alæ* binæ & corporis trunco longitudine suppare, membranaceam *Vespertilionum* modo, in extremis lunatim angulosæ atq; plumatum nigro, viridi, xerampelino, & flavo picturaturæ. Corporis potior pars viridi colorata: *Dorsum* a collo usq; in caudæ exordium, angulosè, palmam alta, membranacea, nigra & ad summities carneolè rubente cristâ alarum. Tergi latera usq; ad caudæ medium intercurrentibus lineolis albis, majusculè seu Conchæformiter maculosa, maculis intervenientibus strijs nigerrimis in tæbias flavas, virides & xerampelinas, desinentibus variegata. *Venter* nigro & albo striatus erat. *Pedes* quatuor, curti quales sunt *Galli*, proportionatè crassi, verum quilibet tribus albis & aduncis unguibus, duobus antrosum & uno retrorsum reflexo, donatus. *Cauda* crassa, obtusa, bipalmaris & quasi conchis aut squammis nigris & virentibus commaculata. Hæc pariter ex relatione *Emanuelis Rodriguez de Leon* Pictoris eminentis, qui vidit, narravit & *Iconem* exhibuit: Eadem confirmant & *Socij*.

De Serpentibus, Viperis, Scolopendris, Julis, &c.

39. *Pangavafun*. Serpens coloris terrei, ad ventrem flavus, mortiferus; *Remedium* rad. Arboris *Pangavafon*.

40. *Ibingan*. Vipera mortifera. *Remedium* reticula *Salagsalag*.

41. *Dumarogonon*. Serpens aterrimus, ventre cinereus, terrecillimus quandoq; crassitudinis fæmoralis.

42. *Mantalaog*. Coluber variè picturatus, venenatus, & perniciosus: Velocissimè saltuatim progreditur, volare diceret, capite erecto, & majore parte corporis erecta.

43. *Tigu*. Serpens, degit in Aqua & Terra, de quo narrant, quod ictus si auxilium petat, venenū in illo qui icto respondit transeat: Ut de aliis quod Venenū eorum per baculum quo percussū fuerunt, transeat in Brachium.

44. *Olopong*. est Serpentum genere habetur pro venenocissimo. *Vipera* Major Hispani.

45. *Dajondubu*. *Serpens* viridis, coloris foliorum *Cannæ Sacchariferae*.

46. *Talbofabo*. *Serpens* viridis venenosissimus.

47. *Dajon palay*. *Serpens* virens coloris foliorum *Orizæ*.

48. *Patongayta*. *Vipera* ex nigro varia.

49. *Tacuib*. *Serpens* aquaticus, furdaster innocuus.

50. *Tuna Bys*. *Udtu Tag*. *Viperula* est semper sub terra degens, magnitudinis Lumbrici terrestrijs, sed gracilior vivissima, mille gyris ac rotationibus quā ocissime sese subducens, coloris fulvi & splendentis; oculos nec Microscopio deprehendere potui: Demorsis somnum inducere ferunt.

51. *Dupung*. *Vipera* species *Tunæ*, coloris atro virentis, crassitudinis digitalis, longitudinis spithameæ, magno & improporcionado capite, perniciosissima.

52. *Buracan*. *Vipera* species *Tunæ*, coloris virentis *Buracan* crassitudinis digiti auricularis brevis, tarda & pigra, minùs perniciosa quam *Dupung*.

53. *Calapiun*. Squammis nigris & flavis variata, venenosa & tardigrada.

54. *Bayo Vipera* a cujus ictu mortifero, oculi & saliva seu spuma virent, ut succus Herbarum.

55. *Ottohan Vipera* parva, tenuis, variè picturata, species *Ibingan*; Mortem inferens ictu ante solis occasum. *Remedium* Excrementum Humanum epotum. Ictus per noctem computrescit, ut mane non nisi in partes distractus tolli possit. *Indus* ab ea ictus, evasit devorata dimidia

et in reticula *Salagfalag*. Pariter & *Inda* ab ea demorsa
freta est devoratis binis reticulis *Salagfalag*.

56. Ongor *Vipera* omnium venenosissima.

57. Fatigatos *Vipera* alia.

58. Viperculam in ovo Galli formatam invenit *Laurentius Pais Sagurezi* Anno 1699.

59. Antonius *Ruizius* de Montoya in *Historia de Paraguay* scribit Serpentes transformari in Arborea & lapidibus aglutinari.

60. De ortu *Guajici* ex Scarabæo vid. l. 3. p. 94.

61. Nec *Scandovulium*, nec *Montoyam* legi, ita mihi retulere qui hæc in eis legunt. *Encalada* & *Merino*.

62. Cornu fragmentum spithameum, & digitos novem crassum vidi apud *Antonium Borjam* à quo dimidium dono habui, erat autem rectissimum, proportionem servatâ tricubitale ad minus, non in gyros retortum, ex tereti quasi obtusi triangulare, solidum, & quasi pellucidum, coloris & ponderis cornu *Rhinocerotis*, subluteo fusci non nigri. an Unicornu verum?

63. Pro Cornu Serpentis dono habui Anno 1699. a D. *Emanuelle Argnelles* ex Insula *Talim*, quæ est *Iacus Bay*, alatum; Cornu pyramidale, sesquiunciale, & fere unciam latum parte sessili, album & quasi osseo-lapideum, solidum & ponderosum, & quod ni fallor cute obtectum fuit, ob subtiles strias supernè subasperum, inferne læve, ad latera ad unum latus inclinatis modicis binis prostantijs oblongis modicum angulosum. De hoc D. *Bened. Carasco* retulit se in chartis MS. legisse valere ad hæmorrhagias & signum legitimum Cornu Serpentis esse, si superpensum aquam dividat: Oblatum nil tale pateat. *Hieronymus Mercurialis* de signis veneni presentis scribit, Cornu Serpentis si teneatur in Mensa, quo tempore venena adsunt, dicunt secretâ quadam Naturæ conditione protinus sudare &c. *Laurentius Forerus* in *Vitridario Philosophico*, titulo *Simpathiæ* & *Antipathiæ*,
Mer-

Mercurialem citans scribit, signa veneni prognostica 3.
Cornua Serpentis, vel *Lingua ejusdem* ...
 veneno &c. de lingua *Mercurialis* nihil. An *Foetus* ...
 lingua intelligat *Glossopetras* Militer ses? Vid. GAZ.
 P.H.Y.L. NAT. & Artis Tab. 91. Fig.

64. Alipihin. Olahipan, vel Lahipan vel Olalaipan
Indorum, est *Scolopenira terrestris*, Hispan. *Cientopies*. non
 tamen 100 sed 50 tantum habet pedes; Est illa quam
Matthiolus depingit *Constantinopoli* alatam: Corpus &
 pedes flovescunt, articulatz incisiones in dorso nigræ
 sunt, corpus cum mystacis ex croceo rubent. Morsu
 dolorifica est, & malè curabilia causat ulcera, a quibus
 præservat *Amonum* legitimum *Dioscoridis*, Masti-
 catum & impositum; cauterium actuale, *Allium* affrica-
 tum, & rasura *Ligni Molayin* imposita; quandoque di-
 gitum auricularem crassa & spithamā longior visitur,
 fusco, luteo, rubente, & viridante variat colore.

65. Atipapalo vel Campopalo *Indorum* est *Scolopen-
 dra Millepeda noctiluca*, ut *Cicindela*, seu *Noctiluca*
Brueri, *Oviedi* & *Cordi*. Teres est, Coloris cyaneo
 viridescentis, multipes; Equos mactat, si in pabulo de-
 voraverint.

66. *Scolopendra terrestr. ducentipeda*. Spithamea est,
 tenuis, coloris lutei, capite fusco, corniculis geniculatis,
 & acuta forcipulā armato, oculos nec Microscopio ob-
 servavi. GAZOPH. NAT. & ART. Tab. 79. GAZ. NAT.
Tab. 79. Fig. 1.

67. *Cacaluy Indorum*, est *Julus Aeneus*, *Millepeda* seu
Scolopendra Rondeletij, dum capitur sese in spiram con-
 volvent; *Julii* cremati pulverem mirifice urinam pro-
 vocare refert *Merula*. Julorum humor cum cruore ex
 oniscis expresso, ad albuginem oculorum tollendam,
 divinum & efficax remedium.

68. *Julis Luzonis alter*. Minor est priore seu æneo, coloris castanei, circulis seu annulis magis gibbosis, ad magis prostantes, & villosos flaventes pedes, lunatis & flavis maculis pictus, nec ita prompte in spiram convolubilis.

69. *Bajur Indorum*, est *Julus maximus innocuus*, seu *Scolopendra* terrest. maxima *Mouffet*. (*Scolopendram* vero titulo *Hypocompi* delineat,) in spiram sese convolvens, ut priores, quem cœpi in Sylvis *Silanzii*, palmo longior erat, pedibus innumerabilibus flavis, gressu undas referentibus, corpore nigro & rubro striatim transversimque variegato. Reperitur & crassitudinis digiti Indicis. Noctu strepitum edit *Gryllo* magis sonorum.

An Account of an Experiment made before the Royal Society at Gresham College, together with a Repetition of the same, touching the Production of a Considerable Light upon a slight Attrition of the Hands on a Glass Globe Exhausted of its Air: With other Remarkable Occurrences. By Mr Fra. Hauksbee, F. R. S.

HAVING had the Favour of making several Experiments, in Relation to the Production of Light from Sundry Bodies, and in Different Manner, before this Honourable Society, which they were pleas'd to Countenance, by their Approbation and Publication of them, as being in some respect or other, Different from any heretofore made on the same subject: Which, with the Hopes I had still of Advancing some farther Discoveries; And that I thought my Endeavours of this kind would not be altogether unacceptable to the Society, Together with the Nobleness of the Subject concurring, prompted me with all willingness to prosecute the same.

The Experiments already made on this head, As the Attrition of Amber on Woollen, Glass on Glass, and with several other Bodies *in vacuo*, which tho' afforded but a weak Light, yet the manner of making them seem'd to open a way to farther Improvements, which, during the late Interval of Meeting, I pursu'd with my utmost diligence. The Result of the many Experiments made on this occasion are compriz'd in a very few, which shall be repeated before this Honourable Society, as Opportunity shall give leave.

One of the first Experiments I made was to see what would be the Effect of a Rarefaction of the Air upon the Light. I took a Glass Globe about 6 inches diameter, and having exhausted the Air from within it, it was taken from the Pump; but first a Cock was turn'd, which prevented the Air from re-entering it. Thus secur'd, and fast fast to give it Motion by the Great Wheel, describ'd in *Phil. Trans.* Num. 304. which when turn'd gave a swift motion to the Globe, on whose surface was apply'd my open and naked Hands, which in a very little time produc'd a considerable Light. And still as I mov'd my Hands from one place to another, that the same Light (which very easily colonies in Clust) might be discharg'd from every part of it; so did the Light improve, till Words in Capital Letters were legible by it, as was observ'd the 1st time by a Gentleman then present. At another time, when I have made the Experiment, the Light produc'd has been so great, that a Large Print without much difficulty might be read by it: And at the same time, altho in a pretty large Room, the whole became terribly illuminated; the Wall at the farthest distance (which was at least 10 foot) was visible. The Light appear'd of a curious Purple colour, and was produc'd by a very slight and tender touch of the Hands, the Globe Glaz at the same time long, hardly sensibly warm. Nor do I find a more remarkable Attribution to advance the Light any thing. Nor is the highest degree of Rarefaction of the Air in the Globe, absolutely necessary in the production of this Light; for it seem'd to continue very well dispos'd in its extent or vigour, till (I believe) more than a fourth part of us Air was let in. I have often observ'd the same, as to the Light produc'd

Since in the Mercurial Experiments, which I have
 made for in those Experiments, I was
 there being such a strong Congregation
 into the Concurrence of them, and of
 the Attraction of Glass, that I have
 some possibly conclude, that the Light pro-
 ceeds from a Quality in the Glass, and not from the Mercury, any
 other ways than as a proper Body, which rubbing or rub-
 bing on the Glass, produces the Light. And that which
 would seem farther to Corroborate such a Conclusion,
 That some time ago I took a Mercurial Battery, and
 rubb'd the upper or Discharged part of the Tube between
 my Fingers, and a Light ensu'd, without the motion of
 the Quicksilver. Yet for all this the Conclusion is doubt-
 ful, and there may be such a Quality as Light in Mercury,
 as well as in Glass or any other body, since an Experiment
 lately made on purpose seems to contend for it, and is as
 follows. I took a small quantity of Quicksilver, and put it
 into a Galley-pot, wherein Varnish often had been used,
 and by that means it had got a pretty thick Lining of it;
 the Weather was at that time moist (which I do not
 mention, because the humidity in the Air, would some-
 times render the Experiment unsuccessful even in Glass, or
 at least mightily impair the appearance of it,) which
 had an influence on the Varnish is something to soften it.
 However, the success of the Experiment was, That when
 the Galley-pot with its contain'd Mercury came to be in
Vacuo, upon shaking the Pump a Light did appear, and
 this without the Concurrence of Glass, or the favour of a
 more proper Season to assist it. Moreover, I am inform'd
 by several Persons of credit, that the Medicine call'd *Mer-*
curius Dulcis, when broken in the dark, gives notable
 Flashes of Light; but the Mercury in the Medicine being
 pointed with Salts, each little Globule of it is enveloped
 with the same, that I cannot be assur'd the Salts do not

contribute to the *Phænomenon*, since I have often observ'd that Loaf Sugar, when struck or broke in the dark, affords a Light, and I cannot tell but Salts as closely united in their parts as the prementioned Sugar, may give a Light upon a violent Separation of them, till I have made some Tryals, in relation (as near as I can) to a true discovery of it: (Which I design with the first opportunity.) The first will be to try whether the Medicine when broken *in Vacuo* will afford any Light, which I think I may expect if it proceeds from the Mercury, since if there be any such Quality in that body, it seems to be the most proper *Medium* to discover it in. Secondly, what the Salts will do without Quicksilver, both in the open Air and *in Vacuo*; for there are some Bodies that appear light in the dark in the open Air, which altogether lose that shining Quality *in Vacuo*. As for instance, I took a piece of Wood, (which I suppose had lain under ground a considerable time,) it was very moist, but not rotten, and appear'd very vividly of the Colour of Fire in the dark: Having included it under a Receiver on my Pump, I found as the Air was taken from it, so did the Fire-like Appearance of it decay, till at last *in Vacuo* it became perfectly void of Light; and as the Air was let in again, so by degrees it recover'd its printing Appearance. This I repeated several times with the like success. Now begging pardon for this long digression, I proceed to the latter part of the Experiment. After the Attrition of the exhausted Globe was continu'd for some time, the prementioned Cock was return'd, which gave liberty for the Air to insinuate into the Globe through the joyns of the Screws; the motion of the great Wheel and the application of the Hands continuing all the while: And as the Air fill'd the Globe, so the mode of Light continu'd to alter, till the like quantity of Air had re-enter'd as was taken from it; then became as great a difference of Light from what was produc'd when evacuated of Air,

Air, as when the Experiment was made in the *Vacuo* and in the open Air. Certain Spots of Light were then seen upon the Fingers that touch'd the Globe, without any great Lustre, and it was very remarkable, that while my hand continued upon the Glass, and the Glass in motion, if any person approach'd his Fingers towards any part of the Glass in the same Horizontal Plain with my Hand, within an inch or thereabouts, a Light would appear to stick to the Fingers, notwithstanding they did not touch the Glass, as was confirm'd by several then present. And my Neckcloth at the same time, at an inch or 2 distant from it, appear'd of the colour of Fire, without any communication of Light from the Globe. Thus much for the latter part of the first Tryal. The former part of both being alike, save only that upon application of white Sheeps Leather in the latter, a very good Light was produc'd, during it was held to the Globe with the Wool side next it; but when the same piece of Leather was turn'd with its other side to the Globe, no Light did ensue, although continued for some time; but so soon as it was chang'd again, the Light would appear as at first, and so upon several Repetitions the same. As to the latter part of this Tryal, the Air was not let in all at once as before, but at several times, whereby the Modes of Light produc'd in the different *Mediums*, were the better observable, although no very great Alteration happen'd either to its Colour or Vigour, till so considerable a quantity, as more than a quarter part of the Globes natural content of Air, was let in; but sometimes before half the Air was suffer'd to re-enter (as near as I could guess) it was not without some pleasure to behold, how the Light began to break in Branches from that side the Globe touch'd by the hands, filling the whole body of it with very odd Figures; and these Branches of Light, at the entrance of more Air, were become in more slender Stems, striking then against the opposite side of the Glass, and thence reverberating again.

in a very pleasing manner; but after more and more
 was let in, so the Light and Heat did in the
 A. 1682 became the same as before. 1682

III. *A Letter from Mr Samuel Daic to Dr Hans Sloane, R.S. Secr. giving an Account of what Manuscripts were left by Mr John Ray, together with some Anatomical Observations made at Padua by the said Mr Ray.*

Here with you will receive divers *and* Observations, that were made at Padua, by one of the learned and most ingenious Friend the Reverend Mr John Ray, upon the dissection of some Humane Bodies, by that great Anatomist Seignior Antonio Marchetti, and do contain, besides those things which Mr Ray did himself remarks, divers Observations of the Operators which did not occur in those Bodies, to some of which Mr Ray hath added Notes. To these are subjoyned two Dissections of Mr Ray's, viz. of a *Hare*, and the *Mountain Hen*, neither of which can I find published in his Works, nor hath he taken any notice of these Observations in his *Book of Travels*, altho the Charge was very considerable, amounting to 284 *Livres* and 15 *Soldi* of *Venice*.

Besides these, there are in his *Adversaria* many Observations, *Inscriptions*, *Epitaphs*, *Antiquities*. &c. which being collected together, would make a large Supplement to his *Observations* already published.

Nor must I forget his Travels in our own and the neighbouring Kingdom, of which he hath left divers *Itineraries*. These may not be useless to our *English Travellers*,

vellers, he being as careful in making O'fences and Collections at home, as he was in foreign Countries.

But his Life been protracted but too near Sixty, he would in all Likelihood have finished his *History of Animals*, for which he had been preparing Materials divers years; this Work being yet unfinished, doth not deserve to be commended to the Press, but to be carried on by some learned and ingenious Person in this Study.

Thus, Sir, I have briefly answer'd the desire of your self and others, in acquainting you with what Manuscripts Mr Ray hath left, which might be useful to the Commonwealth of Learning. I am, &c.

*In Computre assicelo Patavii a Marchetti cense-vata.
10mo Decembris 1683, S. V.*

Eodem modo quo et *Cute* si dissectam exorsus est, *Anterioris* summum autem in *Anterioris* fimbria, umbilico tamen intus.

Cuticula à cute separabat candelum accomodatib re-
re et mo, que cuticulum in vesicam attollebat, unde facile eam scupello separabat. *Cuticula* à cute nisi vel aqua vel potentiori cauterio, i. e. veniente separari nequit.

Sub *Cute* copiosa *Pinguedo* semidigitum crassa abdo me-
totum investiebat. Erit autem pinguedo crebris foveis
veluti fulcris ne d. bluerat stipata.

Sub *Pinguedine* pinnulas seu *membrana* in *cor* re-
men *hac* in p. re caruosa non apparet; et *hac* in p. re
to in *membrana* caruosa aliqui pinnule sed pariet. *Mem-*
branam *hanc* in *Brutis* duplicem esse et licet quia *Brutis*
eum locum movere possunt & corrugare, in homine duplicem
est in fronte unde & frontem contrahere & corrugare possit,
in nonnullis etiam duplex est in O. capite, unde & totum ca-
pillitium comovere possunt. *Verum alii diversimod. lionen-*
assignant horum motuum, nimirum quia in Fronte O. O. ci re

membrana carnosâ cuti a se coheret & in Musculum degenerat, quod prout aliis est.

Tum *musculos abdominis* aggrediebatur, & primum *Oblique descendentes* nec, qui à medio circiter costarum positionem exortu ferrunt cum musculo Thoracis *ferrato* coaptantur, (ut in futuro Ossium) In parte posteriore musculus densissimus huic incumbit, atq; idcirco aliquotumque spatium elevandus est.

Musculi recti eminentijs, seu processibus ossium pubis tendere adrectantur, superius à cartilagine prima costæ nominæ prope cartilaginem ensiformem utrinq; oriuntur tendinibus nervosis.

Oblique ascendentes, à suprema margine ossis *Ilei* radiati fibris exorti, venam musculam recipiunt à ramis *iliacis*. Secundò *Oblique ascendentes*, in quibus nihil singulare, ortum habent à summate ossis *Ilii*: Tendo ejus duplex musculos rectos veluti amplectitur: Una sc. ejus pars à musculo recto incumbit, quæ antequàm dimidium latitudinis musculi superavit, cum tendine oblique descendents arctissimè coheret, vel potius in unum coalescit, ut nulla arte possit separari: Altera sub musculo recto eodem modo cum tendine musculorum transversorum coalescit. Venam accipit à Musculâ dictâ quæ à ramo *Iliaco* oritur.

Musculi recti duas tantum habuere inscriptiones nervosas, cum in alijs 3. alijs 4. aut. 5. habeant, ut observat Vesslingius. In his Musculis observavimus anastomoses venæ Mammariæ internæ & venæ epigastricæ.

Musculi transversî à processibus vertebrarum lumborum oriuntur; non autem Musculi oblique ascendentes illis vertebris annectuntur ut ille observat.

Musculos etiam *pyramidales* in hoc cadavere observavimus, qui rectis oblique incumbunt.

Ob. 1. Pinguedo in dorso Fœminarum liquidior & mollior est quàm in maribus.

2. Cutis in ijs quæ pepererunt circa *Iliâ* corrugatur, in *Virginibus* non item.

3. Vena. Arteria & Nervus semper se invicem decurrunt, ut arteria ad dextram, vena in medio, nervus ad sinistram sit.

4. Sub musculis supra peritonæum prope lumbos exploratam observavimus pinguedinem, unde in hac parte faciliè peritonæo separantur musculi, verum prope lineam latam cum tendinibus musculorum arctissimè cohaeret ut nulla arte separari possit.

5. Musculos etiam in originibus seu capitibus suis tendines habere asseruit.

6. Incepit diffecare musculos à capitibus seu originibus, quia ita motus seu usus musculi in motibus facilius discernitur.

7. Cavendum est Chirurgis ne musculos transversim ad fibras secent, quia ita periculum est ni nervis (qui semper cum fibris parallelis decurrunt) dissecatis, convulsiones oriantur.

8. Si quis velit rectè diffecare & separare musculos, debet accuratè observare fibras, earumq; dictum sibi.

9. Musculi transversi tum in initio, tum in fine latam habent tendinem membranosam.

Ostendit tum nobis *vertebras lumbares*, numero quinque; singulae processus 7. obinent, spinatum unum, transversos duos, obliquè ascendentes duos, & obliquè descendentes duos: Obliquè ascendentes interioris cum obliquè descendentibus superioris per Ginglymon articulantur: Vertebrae verò ipsae per harmoniam, cavitas scilicet superioris gibbum seu protuberantiam interioris recipit.

Os Sacrum ex 6 componitur ossibus nonnullamquam, communiter 5; cum è 6 constet, *os coccygis* tria tantum habet ossa, cum è quinque quatuor. *Os coccygis* interiorius curvatur ad commodiorem sessionem.

In difficili partu, *Chirurgus* immittendo digitum in *Intestinum rectum*, & retrahendo seu reflectendo *Os Coccygis* partum facilitare potest: Quod & *Marchettus* se fecisse asserit.

Os Sacrum magna habet foramina ad egressum nervorum.

Afferit ille *O* à hac quæ nervim constitunt in femoris auxilio non esse quàm in viris pro ratione carceris, ne aliud esset.

Os Illius, Os Pubis, & Os Coxae sunt *Ischium* in adultis in unum velut *os* coalescunt, in Infantibus distincta à *Os*, & cartilagine iuncta. Omnia hæc tria ossa femoris acetabulo coeunt, & singula partem aliquam cavitatis efficiunt. In osse illo distinguit marginem, costam, dorsum, sinus duos, superiorum unum, super quod nervus è summo foramine ossis sacri egressa transiens ad crura descendit, inferiorem alium inter eminentias duas ad commodiorem sessionem.

Nervi egrediuntur ad latera vertebrarum è foraminibus inter duas vertebrae formati.

Ostendit *Viscera & Intestina* in situ, *rectum* scil. *colon* quod omnia intestina circumcinxit; *cæcum* ad dextrum latus digiti parvi magnitudine, quod nunc in foetu & Infantibus nec maiorem, nec excrementis repletum unquam inveniri ex sua observatione asserbat. Supra *cæcum* immediate incipit *Ileum*, quod & majus est & excrementis repletum: deinde *Jejunum*, quod & carnosius, & vasis plenius, & magis rubidum, & excrementis vacuum; *duodenum* ad flexuram terminatur.

Pars illa *Mesenterii* cui *colon* annectitur *Mesocolon* dicitur, reliqua pars, cui tenuia intestina, *κατ' ἐξου* *Mesenteria* appellatur. *Arteria Mesenterica* inferior per totum *colon*, atq; etiam *rectum* ramos spargit, unde *Arteria hæmorrhoidalis*, *mesenterica* superior ad reliqua omnia tere intestina.

Splen in hoc cadavere prægrandis ultra naturalem molem: Hoc illæ ebriitati assignabat.

Colon in hoc cadavere peritonæo adhærebat.

Hijsenti Pyramidales a procellibus seu eminentiis ossis supis utrinq; orti & oblique ascendentes tendacibus suis vicinis in *linea alba* terminantur : inserviunt hi urinæ expellendæ comprimendo *Vesicam* autore *Fallopio* ; ubi hi desunt (ut in nonnullis sic) extremitates musculorum rectorum latiores sunt.

Ostendit insuper *venam umbilicalem*, quæ in fissuram *Lebæ* inseritur, & in *ligamentum* degenerat : *Arterias umbilicales*, quæ peritonæo adnexæ decurrunt ad rames usq; iliacos arteriæ magnæ : *Urachum*, qui pariter adnexus peritonæo ad fundum vesicæ descendit, eamq; sustentat, quinetiam in homine ligamenti duntaxat usum præstare, nec omnino perforatum esse.

Ostendit præterea *uteri tubos*, *uteri ligamenta rotunda*, *scyles muliebres*, & *vasa Spermatica*, nec non *ligamenta lata*.

Hepatis ligamentum latum. Hepar in viventibus & sanis non incumbere ventriculo, ac proinde unguenta, fomenta, & epithemata ventriculi regioni exterius rectè applicari.

Ligamenta uteri rotunda perforant peritonæum & omnes musculos, & deinde divisa unum mittunt ramum ad *Clitoridem*, alterum ad genu usq; q.

Venas & arterias gastricas & gastroepiploicas ostendit & descivit accuratè ; verùm in his omnino consentit cum *Vestugio*, quem adi.

Obs 1. *Bubones* nonnunquam oriuntur etiam in his quæ castæ sunt, verùm in ijs sine suppuratione possunt discuti : *Veneri bubones*, nisi *gonorrhæa* succedat, semper suppurantur.

2. *Valvulam* in coli initio observavimus ; iliacam passionem *Volvulum* dictum oriri a inflammatione istius valvulæ, quæ impedit ne excrementa descendant, ex propria observatione asseruit ; adeo sc. angustatum vidit foramen ut ne cuspidem aciculæ potuerit admittere.

Venæ ventriculi sunt vel propriæ vel communes : Propriæ sunt 1. *Gastricæ sinistrae minores* 3 aut 4. (quarum

prima & brevissima vas breve dicitur) a ramo Splenico venæ portæ propè ænem orta. 2. *Gastrica sinistra major* seu *coronaria*, quia in summitate ventriculi spūsa coronæ in modum. 3. *Gastrica dextra* seu *pylorica*. Communes sunt. 1. *Gastroepiploica sinistra*, quæ a ramo Splenico propè Ænem exorta san lum perreptat ventriculi, hinc in ventriculum inde in omentum ramos subinde spargens, in omentum verò unum insignem epiploicam sinistram dictam. 2. *Gastroepiploicam dextram* in hoc cadavere à ramo mesenterico ortam propè pylorum, quæ pariter fundum ventriculi perreptat hinc in ventriculum inde in omentum obiter ramos spargens, maximo suo ramo seu trunco *gastroepiploica dextra* per anastomosin conjuncta. Est hæc vena insignis & unum præ cæteris memorabilem emittit ramum epiploica venæ dextra dictam.

In fundo *vesiculæ felleæ* nullæ sunt cisternæ, in quibus eo deducant, sed per *sinus* quosdam quæ bileni transmittant, & proinde cum separatur vesicula hepate humor biliosus manifestè exudat. Quinque capillares quædam venulæ ab ipso hepatis parenchymate in membranas vesiculæ sparguntur adeo, ut sine cōfusione sanguinis ab *Hepate* dividi nequeat. Asserit vesiculam felleam quâ parte hepati conjungitur simplici tantum membrana constare, alibi duplici.

Meatus cysticus ubi in ductum communem terminatur valvulum non habet sed *ostium* tantum, quod refluxum bilis impediat.

Hepar 3 habet sinus, unum in quo jacet cystis fellea, alterum in quem intrat vena umbilicalis, tertium ubi transit vena cavæ truncus.

Cystis fellea arteriam habuit grandissimam, venas parvulas. Observatio se dixit ubi arteria magna ibi, ibi venam esse parvam quæ ei responderet, & vice versa. Non credo.

1. Afferit præterea, ubi meatus existens ostenditur. *Oritur* ver-
 iterum flavum oriri, ubi porus eorum ostenditur *aditus*
 nigrum.

2. Vasa venæ portæ & cavæ in hepate non con-
 guntur per oscula, sed per hanc noniam aut inveniuntur etiam
 multa vasorum

3. Venæ portæ intra hepatis parenchyma non induit
 membranam novam

4. Se vidisse venas lacteas in ipsum venæ portæ trun-
 cum insertas.

5. Se nunquam potuisse invenire neque credere dari
 ullum commune receptaculum chyli: *Experimenta mea*
contrarium evincunt.

6. Se vidisse ramum insignem ductus chylicæ in pan-
 creas desinentem.

7. Se putare usum lienis esse, separare bilem atram
 a sanguine, eamque una cum sanguine ad hepar trans-
 mittere per ramos Solenicum, ubi per meum choli-
 dochum expurgatur et intestum.

8. Se putare venas lacteas chylum exugere ex inte-
 stinis, eamque ad pancreas differre, cujus usus est eam
 ulterius perficere & exaltare, partemque excrementitiam
 in intestina per novum vas *Vasungianum* ablegare.

9. Se vidisse venas lacteas in mesocolo ad intestini
 sparsas; quod proculdubio verum est. *Vere nobis visa*

10. Venas hemorrhoidales externas a venæ cavæ non
 oriri, sed ramos esse venæ portæ: Ijus autem futiles
 extremos cutim etiam ipsam perforare, & in tubicula
 sub cuticulâ desinere; & his applicantur Hirudines.
 Oritur Hemorrhoidalis vena aliquando a ramo splenico,
 aliquando à mesenterica, sæpius in ipsa divaricatione
 venæ portæ. Vena hæc ramos suos spargit per totum
 mesocolon

Mesocolon à mesenterio tenuitate sua differt.

Arteriæ setis implæ a coeliaco ortæ tres aut quatuor
 rami lienem ingrediuntur.

Vena

Vena Splenica plures rami per totum lienis parenchyma sparguntur eodemque *globum*, qui asserit eas osculis suis duntaxat in lienem lacis, substantiam verò ejus non penetrare.

Obs. Cui quis ex morbo diuturniore moritur, lien nigricat; si violenter moritur, rubicundior est.

Notandum per *ostia* & *porus cholidochus* eodem in loco duodenum perforatur; aliquando diversis foraminibus in intestinum exiit, ut in canibus fit.

Ascendit nobis in *mesenterio* nervorum plexum; cui usu-

qui?

Porus cholidochus in hoc cadavere mihi videbatur esse amplissimus.

Ren sinister in hoc & alijs omnibus major est dextro & superius situs, & à trunco venæ cavæ remotius, unde & emulgens longior est. Huic rei rationem sane probabilem dedit, quia *hepar* in dextro latere ei incumbens tum illum deprimit, tum augmentum ejus prohibet.

In dextro latere duas habet hoc cadaver *arterias emulgentes*, unam consueto loco in sinum renum ingredientem, aliam in superiore extremitate.

Ureteres in hac foemina amplissimi, quod ille omnibus foeminis commune esse asserit, qui humidiores sunt, & plus mingunt.

Glandula renalis dextra ab ipso venæ cavæ trunco venam accipit; sinistra verò ab emulgente. Glandulae interiorius cavitatem habent. Dextra ipsi reni incubuit.

Arteria spermatica utraque ab ipso aortæ trunco infra emulgentes sibi mutuo proximè oriuntur. Venarum altera ab emulgente, altera nimirum dextra duplici trunco, uno ab emulgente, altero trunco venæ cavæ, qui paulo post in unum conveniunt, exoritur.

Affirmavit se vidisse venas lacteas in prægnantibus ad uterum sparsas; quas probabili conjecturâ aquosum illum Serum in quo infans natat ad uterum diffetri putat. Venas hæc lacteas in Ove prægnante facillimus inveni.

Intestini ...
 oritur.

Multis ...
 concavatur ...
 sperguntur.

Uteri ...
 in antea ...
 ab utero ad extremitates eorum usq; passim stylus immittitur.
 Tunica eorum interior albicat, inq; ijs sepius reperitur
 humor serosus albidus, qui *sen en azalibre* esse creditur.

Testiculi muliebres epididymidibus carent; una extremitate nervosis ligamentis utero annectuntur; substantiam habent molliorem laevoremque testiculis masculorum. Unus horum exulceratus cavitatem habuit.

Quod *testes* tam in maribus quam in foeminis ad generationem nihil conducant memorabili imprimis experimento probavit. Canis nimirum masculi testes executi epididymidibus integris relictis, deinde ad canem sceleratam in cubiculo concussit per tres annos, nec ullam admisit ad eam canem cum solaxisset praeter eadractionem hunc, qui canem iniit & cum ea sepius implicatus est Triennio haec ter peperit, una vice 7 catulos altera 9, tertia 5. Resatis explorata foemiram diuinit. Alias duas vel tres historias huic parallelas nobis narravit; unam de Equo castrato relicta tamen epididymide una, qui equas sepius impraegnavit, fuitq; in venrem admodum proclivis: Alteram de cane quem ipse servus executi: Tertiam de homine quodam rustico, qui ob habones venereos utrumq; testem amisit. & epididymide unica dumtaxat manente, qui tamen uxorem duxit, & tres masculos filios genuit. Credit ergo ille testes non alij usui inservire quam quem *Aristoteles* adfert, nimirum ut *sint pondera impediencia ne Spermatice vasa implerentur*; & revera vasa feminalia in eos non terminantur, nec transeunt, sed epididymides solum.

Vagina hæc ultra interiùs uteri orificium inferius percurrit, unde si membrum virile longius quàm par est fuerit, ultra orificium interius uteri in hunc sinum sperma projicit, unde uxorem imprægnare nequit.

Ait se observasse etiam in fæmiis utero gerentibus uterum fuisse duos ferè transversos digitos crassum.

Obs. 1. Ratio cur virgines coitu liberantur à morbo illo nostratibus (*The Green Sicknes*) est quia membrum virile distendit nonnihil vaginam uteri, & fixatione sua refert orificia venarum, adeòq; menses affluere facit.

2. Locus ubi foeminæ calculo laborantes à *Chirurgo* debent scari est in superiore vulvæ parte prope labia, *Stylum* in *urethram* immittendo, & super eam secando in carnosæ vesicæ collò.

3. *Urachus* in homine (né in foetu quidem dum adhuc in utero matris latitat) perforatus non est ex observatione *Marchetti*, sed usum tantum ligamenti ad sustentandam vesicam præstat.

4. Se nunquam in medio ureteris hærentem invenisse calculum, sed semper vel prope infundibulum, vel prope vesicam.

16to Decembris.

Ostendit *Musculos pectoris*, & primò *pectorales* dictos, qui inserviunt adducendo brachio ad pectus, horum & insertionem q. in *Vesling.* deinde *Musculos serratos anticos minores*, qui inserviunt humero antrorsum adducendo, & sub pectoralibus sibi sunt in processus *coracoides* inserti.

Tum *musculos serratos anticos majores*, qui inserviunt scapulæ antrorsum deorsumque ducendæ; in basin *apophyse* inseruntur.

Post *intercostales externos*, qui ab inferiore latere costæ superioris orti in superiorem marginem costæ inferioris inseruntur; & tandem *intercostales internas* qua à superiore margine costæ inferioris orti in inferiorem marginem costæ

superioris terminantur. Horum musculorum fibræ se invicem obliquè intersecant in crucis *Andreæ* formam : Neutrorum scil. Fibræ ad costas perpendiculares sunt sed obliquæ.

Notavimus *venas* & *arterias mammarias* ; *externas*, quæ ab axillaribus oriuntur ; & *internas*, quæ à Subclavijs ortæ, & intra cavitatem Thoracis aliquouſq; progressæ in duos dividuntur ramos, unus musculos Thoracis perforat & in *mammas* distribuitur, alter deorsum tendens usq; ad medium recti musculi ibidem cum vena epigastrica extremitatibus suis per anastomosi conjungitur.

Dixit se observasse singulos venæ hujus capillares ramulos in singulos mammarum tubulos desinere, & proinde se putare lac non à chylo sed a sanguine generari.

Musculi subclavij a claviculis, ubi acromio junguntur, orti in costam primam, ubi cartilagini sui committuntur desinunt.

Observavimus *Sphincterem* & *levatores ani* dictos musculos, qui ab infimo ossis sacri, ubi coccygi committitur, oriuntur omnes.

In *ulceribus ani* & *fistulis* cavendum est *Chirurgis*, nè fibras Sphincteris transversim secent, quoniam ita amittitur facultas retinendi excrementa.

Vena cephalica dissepit & distinguit musculos pectorales & deltoides.

In collo primùm observavimus *platysma myodes* carnosum, scil. panniculus hoc in loco in musculum degenerat, qui mento affixus caput deorsum trahit.

Deinde *Musculos Mastoideos* dictos : Tum musculos *diaphragmaticos*, qui medio suo tendine *Styloceratohyoides* musculos perforant.

Ostendit musculos *ossis hyoidis*, quorum sex sunt paria :
 1. *Sternohyoides*. 2. *Coracohyoides*. 3. *Styloceratohyoides*.
 4. *Thyreohyoides*, 5 & 6 *Geniohyoides* internum & externum.

Præparavit insuper *columellam* cum musculis ei famulantibus, quorum duo sunt paria, nimirum *pterygoſtaphylinum* internum & externum.

Ostendit

Ostendit musculos *Cartilagineos Sant. formis*, quorum
3. sunt paria. 1. *Sternohyoideus*. 2. *Cricothyreoideus*.
3. *Hyothyreoideus*.

Musculos *Cartilagineis arytenoideis*, quorum 4 sunt paria :
1. *Thyreocarytenoides*, 2. *Arytenoides seu Sphincter*, 3. *Cricocarytenoides laterales*, 4. *Cricocarytenoides posticum*.

Musculos *pharyngis*, quorum 3 paria : 1. *Stylopharyngeus*,
2. *Spheno-pharyngeus*, 3. *Cephalo-pharyngeus*, qui potius
carnosum *oesophagi* intium sunt, quam musculi ; etiam Mus-
culus *oesophageus* dictus qui gulam constringit.

1. In *Angina Spuria* inflammantur tonsillæ, in *legitima*
Musculi Laryngis, sed præcipue *Arytenoides*.

2. In *Angina Legitima* ipsius Parens fecit incisionem in
laryngem inter duos *annulos superiores*, fistulâ argenteâ in
vulnus immisit, per quam patiens inspirabat expirabatque,
adeoq; eam curavit. Oportet autem ut Chirurgus inci-
sione facta, dividat paulum & diducat curiosè Musculos
Sternohyoides & *Sternothyreoides*.

3. Dixit se observasse ramulum *ductus Thoracici sive*
chyliiferi ad pericardium tendentem, per quem immisso
tubulo inflavit pericardium, unde non absque ratione
conjectabatur lympham in pericardium derivatam esse.

4. Pulmo humanus ungulæ bovinæ specie externa
similis.

5. *Asperæ arteriæ* rami seu bronchiæ intra pulmones
cartilaginibus angularibus carent.

6. *Valvulæ venæ cavæ tricuspidæ* dictæ sunt, arteriæ
venosæ mitrales, quia ambæ junctim acceptæ mitram epis-
copalem quoq; modo representant ; *valvulæ venæ arteri-*
osæ sigmoides dictæ sunt, *aortæ semilunares*.

Pericardium in hoc cadavere præter naturam dia-
phragmati in sua cuspide erat adnexum.

Observavimus *glandulam geminam* infra *laryngem* sub
musculis *Sternothyreoides* ad utrumque *asperæ arteriæ*
latus, quæ in *Bronchocele* *venæ obnoxij sunt* *Alpium &*

montium altissimorum incolæ) mirum in modum intumescunt.

Observavit insuper dudum Thoracicum unum ramulum mittere ad glandulam parotidem.

18vo Decembri:.

Præparavit Musculos dorſi, nimirum 1. Musculos *trapezios* seu cuculares dictos à figurâ, de quibus abunde *Vesling*. 2. Musculos *rhomboides*, in basin Scapulæ desinunt. 3. *Levatores Scapulæ*, patientiæ & pauperum musculi dicti, quia pauperes cum eleemosyna eis negatur Scapulas levant dicentes, *Oportet patientes esse*. 4. Musc. *latissimum dorſi*, in summitatem cubiti inseritur, & ab officio *Aniſcalptor* dicitur. 5. *Serratos poſticos minores*, qui superiores. 6. *Serratos poſticos majores*, qui inferiores. 7. Musc. *longissimum dorſi*, qui discurrit per totum dorſi longitudinem, initio musculis sacrolumbis unitus, singulis costis duas anſulas seu tendines nervosos largitur, qui se mutuò decussant in crucis formam, anſulæ ſci. exteriores sursum tendunt, interiores deorsum. 8. Musc. *Sacrolumbos* qui præcedentibus initio juncti interiùs, & processibus vertebrarum spinatis ad collum usq; protendantur, singulis costis anſulas pariter donando, verùm exteriores hujus anſulæ carnosæ sunt, & non tendinosæ, quemadmodum præcedentis. 9. Musc. *Semispinatos*.

Præparavit insuper Musculos capitis & colli; & primò *Splenies* dictos, quia Splenem bubulum repræsentant, in occiput inferuntur, atq; etiam (quod non habetur apud *Vesling* alioſve) tendinem satis validum à reliquâ sui parte divisum ad processum transversalem 2dæ cervicis vertebræ mittunt. 2. *Complexos*, adeo dictos quòd quasi à diversis musculis compositi videntur. 3. *Rectos majores* sive externos. 4. *Rectos minores* sive internos, a primæ vertebræ tuberculo exortos. 5. *Obliquos superiores*. 6. *Obliquos inferiores*. 7. Musculos *masseideos*. 8. *Longos*. 9. *Scalenos*. 10. *Transversales*.

les. 11. *Spinator*, de quibus consulantur auctores. Talem præparavit Musculos *Sacros* & Musculos *quadratos*.

Monstravit musculos faciei. In fronte membrana carnosissima in musculum degenerat, ibi incipiens duplicari ubi desinunt capilli.

Obs. 1. Musculi labia obliquè moventes seu dividentes, *Sardonii* dicti, in morbo illo risu *Sardeo* nimium debent secari.

2. Si caput inungatur pinguedine supra Cranium humanum nascente capillos abunde producit.

3. Qui è Febri maligna moriuntur, iis intestina post mortem livida aut viridi-coerulea apparent.

4. Non est pericranium à periosteo diversum, verum periosteum in capite dicitur pericranium, potestq; in plures v. g. 7. vel etiam 10. plagulas dividi.

5. Musculi temporales ob tutelam & ut in situ continentur membranà proprià conteguntur, quam nonnulli falsò pro pericranio habuerunt. Cavendum est ne hæc membrana lædatur: Siquidem vulnus ei inflitum, non rarè convulsiones excitat, unde & hujusmodi vulnera lethalia habentur.

19no Decembris.

Præparavit musculos faciei: Nasi duos, triangulares sci. & obliquos: Oculi, sphincterem palpebrarum: Labiorum, elavatores sci. labii superioris, quorum duo paria; unum ab angulo interiore oculi ortum labiis & naribus commune. Musculi ab osse jugali nati, ideoque *Zygomatici* dicti, in risu *Sardeo* dissecandi sunt. Observavit in nonnullis hos Musculos deesse. *Constrictor* sive *Sphincter* labiorum Musculus nonnullis *Basiatorius* dictus. Depressores Labii inferioris ab imo mento exorti, admodum spongiosi ubi pili crescunt. Aliud par, quod Labium inferius & superius simul deorsum abducit, in angulos musculi Sphincteris sive Oris insertum.

Musculos

Musculos maxillæ inferioris, scil. *Temporalem*, *Massetarium*, *pterygoideum* internum & *pterygoideum* externum, qui maxillam sursum trahunt omnes; *digastricos* deinde, qui deprimunt.

Not. 1. In cranio perforando trepano, cavendum est a futuris; nam si *Dura Mater* (quæ per suturas cum pericranio committitur) lxdatur, periculum ingens est nè agrotus convulsus moritur.

2. Cerebrum humanum ingens est, corporis magnitudinis respectu habito.

3. In Cerebri ventriculis observavi duo corpora *Hippocampi* & *Eomôyes Arantio* dicta ob similitudinem.

4. Cerebrum non pulsât per se, sed Arteriarum respectu: Nam si animalis vivi cranium aperias Cerebrumq; denudes, & ex una parte *Menyngem piam* amoveas cum vasis eidem intertextis, videbis alteram partem pulsare, alteram verò nudam membranâ non item. Asserit seipsûm hoc expertum esse, cerebrumq; post amotionem Cranii plûs horæ quadrante pulsasse.

5. Observavimus nervorum par 4. seu *Fallopianum*, qui a posteriore Cerebri parte exorti, ad latera basis Cerebri reptantes, juxta tertium par exeunt.

6. Observavimus plures nervos è 7. conjugationibus non simplices esse, quamvis ex uno foramine exeunt, sed revera divisos & multiplices, nimirum tertium & quintum par ex 4. utrumq; nervis constat, sextum ex 8. vel 10. verum omnes illi simul sumpti non adeo ampli sunt ac ego putaveram.

7. *Glandula pituitaria* major est in homine & solidior, quàm ego in animalibus observare solitus sum.

8. Sub infundibuli membranâ duo nobis ostendit corpuscula alba vicæ magnitudine, testiculi figurâ, quæ fratrem suum primûm invenisse dixit, verum habentur pîstæ apud Vesslingium.

9. In foraminibus Narium maximis observavi 4. corpora, aut etiam plura, oblonga, spongiosa, membranâ tecta, quæ (ut probabile est) Mucum ne defluat impediunt.

10. *Fia Mater* composita videtur ex tunicis venarum & arteriarum, quæ eam crebræ perreptant.

Post aggressus est Oculi dissectionem, in quo Musculos 6. notavit. 1. *Elevatorum, Superbum & Hispanum* dictum. 2. *Depressores, humiles & Capucinos.* 3. *Adducentes, bibitorios & Germanos.* 4. *Abducentes, meretricios.* 5. *Obliquantes, & 6. Trochleatores, amatorios* dictos.

Anterior tantum tunica humoris crystallini aranea dicitur, posterior pro parte *hyaloidis* habetur.

Observavit Musculos in singulos ingredientes nervos; de Musculis Oculi loquor.

Vesiculæ seminales ad vasa deferentia, immediate supra *glandulas prostratas*, veluti alæ utrinq; adjacent, originem seu radicem suam juxta glandulas habentes.

Capsulæ Seminales nihil aliud sunt quam vasa deferentia dilatata immediatè supra glandulas prostratas.

Meretrices in coitu habent artem Vulvas coarctandi, os coccygis protrudendo introrsum, adeoq; coitum jucundiorē reddendi.

21mo Decembris.

Observavimus in uno cadavere Arteriam Spermaticam inferius a trunco Arteriæ magnæ ortam ascendere & emulgentem supergredi.

Vidimus manifestè *Capsulam Spermaticam* perforatam in *Urethram*, atq; etiam in vesiculas seminales, adeò ut in utramque faciliè stylum admittat. Foramen illud, quod in urethram exit per tuberculum in ipso vesicæ collo, seu caruculam in urethræ initio, valvulam habet quæ impedit nè *Sperma* involuntariè exeat, aut in capsulas regrediatur.

Asserit

Asterius ille se nunquam invenisse semen in glandulis prostaticis, neq; agnoscere ulla foramina per quæ Semen in urethram exeat. *Ego aliter sentio, & puto Sperma in his glandulis contineri etiam in homine.* Putat ille glandulas istas tantùm factas esse, ut vesicæ collum comprimerent, adæque conducant ad Semen cum impetu ejaculandum.

In Urethra summa, in glande sci. penis propè extrematæ, canalis se dilatat & fovcolam efficit, in qua si materia aliqua acrior aut putrida stagnet, sive Sperma sit, sive urina, acerrimos dolores creat, & pustulas causat.

Gonorrhæa flava vehementissimos excitat dolores.

Musculos manûs disseccuit. Hi autem sunt. 1. *Deltoïdes.* 2. *Coracoïdes*, qui humero attollendo inserviunt. 3. *Rotundus major.* 4. *Rotundus minor*, qui humerum deprimit. 5. *Spinatus inferior.* 6. *Spinatus superior.* 7. *Infrascapularis* sive *demersus*; qui humerum circumrotare creduntur. 8. *Biceps*, præcipuè notabilis ob duplex initium, quorum alterum in sinu vel foveolâ ossis humeri capiti insculptâ, velut nervus arcûs in fibula, tendine suo immittitur. 9. *Brachialis*; qui cubitum flectunt. 10. *Musculus longus.* 11. *Brevis*; qui simul juncti. 12. *Anticonæus*; simul cubitum extendunt. 13. *Quadratus.* 14. *Teres*; qui pronatores dicuntur. 15. *Supinator longus.* 16. *Supinator brevior.* 17. *Musculus palmaris*, qui per totam manûs volam expanditur. 18. *Flexor Carpi externus.* 19. *Flexor Carpi internus.* 20. *Extensor Carpi externus.* 21. *Extensor Carpi internus.* 22. *Flexores primi internodii*, *Lumbricales* dicti, a tendinibus flexorum 2di internodii ori & carnosî. 23. *Flexores secundi internodii*, *Perforati* dicti, 24. *Flexores tertii internodii*, *Perforantes* nominati. 25. *Abductor minimi digiti.* 26. *Annularis.* 27. *Medii.* 28. *Indicis* indicator dictus præcipuè notabilis. 29. *Abductor Indicis.* 30. *Medii.* 31. *Annularis.* 32. *Auricularis*, musculi in formam crucis intra digitos collocati, atq; *Interossei* dicti. 33. *Flexor primi internodii pollicis*

34. *Flexor* 2di internodii, qui in 4 partes test. 35. *Abductor*. 36. *Abductor* pollicis. 37. *Flexor* 3ii internodii. 38. *Extensor* primus pollicis. 39 *Extensor* 2dus. 40. *Extensores* digitorum, qui articulos singulos vultu investiant.

25to Decembris.

We saw the operation of cutting a Child out of the Womb, performed in a Carcass by Marchetti the younger : This is called *Partus Cesareus*.

He told us that himself had taken a Child out of the Mothers Womb, after she was dead, which lived 2 or 3 days.

Incisio facienda est in uno latere, cavendum à linea alba & locis ei vicinis, propter musculorum tendines, qui illi omnes conveniunt, & si secentur difficiliter coalescunt: In illo etiam latere, seu ibi, ubi infantis caput existere, seu ita reprehenditur.

In incisione facienda magnam adhibere oportet cautionem, sensim & leniter secando, ne intestina vulnerentur: Postquam Chirurgus Musculos omnes & peritonæum perforaverit, de reliquo debet immittere duos digitos, adeoque omnes musculos & peritonæum attollere, atque digitos sursum versus scalpellum dirigendo secare. Ita cum aperit uterum summopere cavendum est prout ne foetum vulnerat.

Postquam foetus eductus est, vulnus consuevendum est per omnes musculos & membranas adueto; & fila connectenda sunt in singulis puncturis. Uterus ipse nullo modo consuevendus est.

Hoc facto in uterum injici debet Decoctum Saniculæ, Contolidæ, & aliorum vulnerariorum; item Vinum maximè austerrum. Vulncri autem externo abdominis primò applicari debent lintea albumine ovorum madefacta, deinde Emplastra, ut Diapalma &c. quòd si vulnus ad suppurationem veniat immittenda est in inferiorem partem turunda.

Dixit se nunquam potuisse observare ossa pubis in partu separari, nam & ipse in partu difficillimo ei parti manus imposuit, nec potuit sentire ullam disjunctionem aut oblentionem. Habet etiam argumentum ex Hippocrate contra hanc sententiam desumptum à callo, Qui inter ossa fracta aut luxata existere solet, & in futurum horum ossium separationem impediat.

10 Januarij.

In a Hare dissected we observed the *Intestinum rectum* of a very great length, having large *pilulae* of Dung *secundum intervalla*. I call here the Gut (so far as it had no *cellulae*) *rectum*, though indeed it had one or two convolutions.

The *intestinum caecum* was of a vast bigness and length: In bigness it far exceeded the *Colon*, and was full of Excrement. Just at the entrance into it out of the *Ileum* was another *appendix* of a globular figure; the *tunica* of it more fleshy, and fuller of Veins and Arteries than the adjoining *caecum*; there was also a little round hole in it. The *caecum* towards the farther end of it was small, round, fleshy, full of Vessels, red coloured like the *jejunum* in a Man; the inner *tunica* granulated, and this for more than 4 inches in length.

The *Spleen* was small and long, thicker at one end, it had no *Vesicula fellea* that I could find; (In another we found the *Vesicula fellea* manifestly :) The *Kidnies* large, and the Left situate higher than the Right. The *glandulae renales* received not their Vessels from the *Emulgents*, but from great Veins on each side going to the Loins.

The *Stomach* was full of Grass (as I conjectured) which smelt like the Wax of an Honey-comb when the Honey is newly drained from it.

It was a Female, and had long *cornua uteri*, but did not *gestare* when we cut it up.

It seemed to have such a cavity under the Tail, above the *foramen ani*, as I have observed in a *Badger*.

I believe now that the Matter contained in the *Stomach* was *Fir* chewed small, the which the smell argued.

2do *Januarij*.

In Gallina montana observavi appendices duas prælongas, dimidium ulnæ excessisse credo: Ad principium suum ubi a recto oriuntur post 3 aut 4 uncias reflectuntur seu convolvuntur, at in prima hac convolutione nulla intus excrementa continent; tum sursum juxta intestinum utrinque ascendunt, & sunt amplissime atque excrementis plenæ: Ad ingressum suum ubi intestino recte cohærent habent velut annularem Musculum seu Sphincterem.

Hæpar satis grande, in duos præcipuè lobos divisum. Vesicula bilis nullam inveni, verum poros biliarios duos nigros diversis osculis non procul tamen distitis sese in intestinum ducentes.

Uter exiguus et irregularis Ventriculus mediocris, musculosus: cujus interior tunica in duritiem fere corneam concreverit aliqua sui parte: Cor amplissimum.

In ventriculo & ingluvie summitates & germina Abietis frondium, quæ apertæ resinaceæ & non ingraturæ expirabant odorem, materiæ in Leporino ventriculo contentæ simillimum.

IV. Of *Hydatides* inclosed with a Stony Crust in the Kidney of a Sheep. By Mr W. Cowper, F. R. S.

IN the *Sheeps Kidney*, which was ordered at a late Meeting of the Society, to be set aside for me to examine, I found a large whitish body, inclining to yellow, and ting'd with red, as it lay under the Membrane of the *Kidney*, *vid.* Tab. I. Fig. 1. A. This was very hard, as is usual in Animal Petrifications, 2 thirds of it lay hid within the substance of the *Kidney*: It was inclosed with a thick hard Membrane, that could not easily be separated from it, even with a Needle fixt in the end of a Stick. The Branches of the Emulgent Veins and Arteries, lay between it and the *Pelvis* of the *Kidney*; all which *Vessels* were somewhat prest by this petrified Body. As I was picking off its thick strong Membranous Inclosures, I found the Needle slip into a cavity at an *Aperture* Fig. II. By this I was inform'd (of what I must confess, before I had no suspicion of) that this hard and heavy *Petrified Body* was hallow, whereupon I thought of dividing it with a *Saw*, but finding a Membranous Interstice in it, Fig. 2. B. I pull'd it asunder, as express Fig. III. and found its inside divided by many *Petrified Cells* of irregular Figures, and fill'd with *Hydatides*, some of which are represented at D.

This uncommon appearance (at least to me) of a *Petrified Crust* inclosing *Hydatides*, I thought deserv'd the Figure annext.

Tab. I. Fig. I.

The external Surface of the *Kidney* of a *Sheep*.

A. The *Petrified Body* as it appear'd in it before dissection.

Fig.

Fig. II.

The inferior Surface of the same Petrified Body, after the Membrane that inclosed it was taken off.

a The Hole by which it was discover'd to be hollow.

B. The *Fissure* by which it was divided, to shew its inside express'd.

Fig. III.

C. Its *Petrified Cells* that contained the *Hydatides* of various Sizes and Figures, express'd at D when taken out.

V. *Microscopical Observations on the Structure of the Spleen, and the Proboscis of Fleas. By Mr Anthony Van Leeuwenhoek, F. R. S.*

Delft, June 1. 1716

AMongst other things it has been observed, that the Spleen is compos'd of a spongy sort of Flesh:

And having examined the Spleens of several Sheep, I found that the many Fibrous parts, of which it generally consists, and which many suppose to be Arteries and Veins, are in reality no Veins, but are united to, and draw their Nourishment from the Membranes in which they are radicated, and spread themselves into many Branches, and join with the Fibrous parts, which likewise appear with Root and Branches growing out of the opposite Membrane, that I could not forbear viewing them with astonishment; imagining that all the innumerable Fibrous parts were constituted to no other end, than to procure the blood which is conveyed into them by the Arteries; which Blood in great quantities is contain'd in the Veins, as may appear in great measure in those

Veins

Veins which resemble Arteries; for the Spleen can have no Blood conveyed into it, but what is brought to it from the Heart by the Arteries.

Now this Blood which is carried through the Arteries, that are joined to the Veins, and make the same Sanguinary Vessels, being transported into the great and large Veins of the Spleen, cannot, in my opinion, be carried back again into the Heart with such a force, because the Blood that issues out of the Spleen, is not carried first to the Heart, but immediately to the Liver.

This being granted, I conceive that there is a necessity of a 2d motion, to protrude the Blood out of the Spleen into the Liver, consisting herein, that as the Spleen in Sheep is in great measure joined by a Membrane to the Diaphragm and partly to the Stomach, as often as the Breath is drawn in, the Diaphragm is extended, whereby the Spleen is compressed, and the Blood thereby so forced into the great Vessels, that it carries part of it to the Liver, and when the Breath exhales, then those Fibrous parts are freed from that Pressure which they underwent by the drawing in thereof, and so by the extension of the said Fibrous parts, they more easily imbibe the Blood out of the Arteries.

Now if the Spleen had not such a continual motion, the Blood contained in it would be very little agitated, because (as I suppose) that the Blood in the Veins of the Spleen, is at least twenty times more than that which is contained in the Arteries.

Which motion sufficiently prevents the Blood from stagnating in the Veins, though the course of it be somewhat slow, for the Globules of the Blood, as far as I can discover, do always coagulate in order to effect a Stagnation of the Blood.

They also say, that the Spleen does purify the Blood, that it may cause no obstruction in the Liver, but those Opinions seem strange to me, and I would ask the People

ple that are of that opinion, where that foul Blood can remain, since there are no other Passages in the Spleen but two, *viz.* one Artery to bring the Blood into the Spleen, and one Vein to carry it out.

Moreover, I inserted a Glass Tube into the great Vein of the Spleen, and having bound with a Thread the Orifice of the Vein, I blew into the Tube, and wonder'd to see how much the Spleen swell'd with it, and when I forbore blowing, the Wind return'd upon me, and the Spleen sunk; which Experiment I tryed several times with like success.

This Experiment is much like the blowing Wind into the Lungs of any Animal, which when one leaves off returns back again: But so far as in the Spleen by accident there was a little Hole, we could not produce that effect without stopping the Hole with one of our Fingers; and this Experiment I have not only repeated in the Spleen of Sheep, but also of Oxen and Cows.

They say that the Spleen consists of a spongy Flesh. I must own I could not discover that; for I allow of nothing to be Flesh, but where the Parts are extended in length, and lye in a regular order by one another, and so compose a Muscle, and the ends of these Flesh Particles are joyn'd in a Membrane, or make a Tendon of a Muscle; whereas the parts of a Spleen (at least as they appear to me) setting aside the Fibrous Parts, the Arteries and Veins, are compos'd of very small Particles, which were so exceeding fine, that I could give you no Figure of them; and it seem'd to me, that as the said Fibrous Parts, spread themselves out into an unspeakable number of very small Branches, the said very small Particles are depending on the Fibrous Parts.

One cannot so separate these small Particles of the Fibrous Parts, in order to set them before the sight, but one must break and dissolve not only the very small Branches of the Veins of the said Fibrous Parts, but also of the

Veins

Veins and Arteries themselves, the more because that the Arteries are conveyed into the Membrane only by the very small Branches: Yet it happened to me once, that I cut a Slice of the Spleen at the thinnest end of it, one Part of which remain'd fastened to the said Spleen, in which I observed an Artery, with several of its Branches, lying across the said Fibrous Part, without being joyned to it, only the extrinsec Parts or Branches thereof, as far as I could discover, insinuated themselves into the Membrane.

Now that this was really an Artery, and no Vein, I was fully satisfied, partly because the Tunick or Coat thereof was very thick, and partly that it was a Blood Vessel, because the Cavity where it was cut off appeared very plain to me, which I could trace almost through the whole length of it; beside, I imagine that the Veins, by reason of the thinness of their Tunicks, could not undergo so many Motions or Postures as I was obliged to put them into, in order to expose the Fibrous Parts plainly to the sight.

Thus far had I brought my Observations, which I had made only in order to review them at any time, but being informed that a certain Gentleman having writ something about the Spleen of a Man, had amongst other things affirm'd, that the said Spleen was not compos'd of Particles of Flesh; and moreover, I having been very free in delivering my Thoughts about the Consistence and Motion of the Spleen, I thought fit to place a small Particle (as I had prepared it) of the Spleen of a Lamb that was about a year old before a Microscope, and to cause a little part of it to be Painted, concluding that the Spleen of a Man, an Ox, or a Sheep, are of much the same Nature one with another, though perhaps their Figure either in length or thickness is something different; thus declaring that I shall not depend upon the Discoveries of any other Person.

Tab. II. Fig. I. Represents a very thin an' ¹/₂ of it that I had cut off the Spleen of a Lamb, from the thickest part of it; for if I had cut off a piece from that part which was much thicker, it would have made too large a Figure.

In the said Fig. I. is represented by A. B. C. D. E. a small Particle of the Membrane of the Spleen, like other Membranes, but exceeding thick and cover'd with another that was thinner; from the innermost Membrane does proceed the Fibrous Parts that lye between B. H. and G. I. and seem to be torn off from the small parts of the same.

The opposite Membrane is represented by O. P. having also other Fibrous Parts fastned in it at Q. R. S. T. from whence it plainly appears, that the Fibrous Parts are one and the same, tho they proceed from two opposite Membranes; and forasmuch as the Spleen has none of those Flesh Particles of which the Muscles are compos'd, and which are the Instruments of all Motion, these Fibrous Parts, I conclude, perform the same Uses as the Muscles.

Here we may see how wonderfully the Fibrous Parts, that are already describ'd between B. H. and F. G. spread themselves into Branches, and are again united in H. L. and M. L. from whence again they are multiplyed into many more small Sprigs; and I have seldom observed that any Membrane, how thin soever I had dissected it, was provided with so few Branches as are here represented between B. H. and G. F.

In the Fibrous Parts that lye between L. M. N. and Q. R. S. T. there are abundance of exceeding small Particles, very great Numbers of which were broken by me and cast away; all which I conclude are compos'd of exceeding small Particles which make the Spleen, and which small Particles I imagin to proceed out of the Fibrous Branches, which upon account of their smallness appear to me to be little small Globules.

The Fibrous Branches represented by V. V. V. are those that were cut off with a Knife.

Forasmuch as it was not easy to discover with the Eye, the little Fibrous Parts, with their Branches and Roots, and the Section of the Membrane, I caused the Painter to draw a small Particle of the same thro' the Microscope, just as 'twas taken in the Membrane. as may be seen in Fig. 2. which Membrane is there represented by A. B. as are also three Branches by C. D. . D. E. and E. F. All which are united in the Fibrous branch C. H. I. and then we saw now each of the three said Branches, with those Parts thereof that I call Roots, were proceeding out of the Membrane, as is here shown in Fig. 2. between F. K. . E. L. . D. M. . and C. N. inasmuch that the Painter said to me, that he never in his life saw more Roots with his naked Eye going out of a Tree that was thrown down with the Wind, than he saw in this Figur .

That we may have a more exact Idea of the structure of the Spleen, I handled some parts thereof much more gently than I had done the greater, that I might lay the fibrous Parts naked ; after which I placed a small Particle thereof before a Microscope, and caused the Painter to describe the same as well as he could.

Fig 3. A. B. C. D. E. F. G. H. I. represents a little piece of the Spleen, which to the naked Eye was no larger than a coarse Grain of Sand. In which Figure between A. B. and A. J. you don't only see the small Branches that shoot out of the Fibrous Part, which are also compos'd of much smaller Parts themselves, but one discovered also in the said small Particle, that it self in the length of it did also consist of long Particles like Fibres. Then who knows, but each of those fine Particles are Tubes or Vessels, to convey that very thin Juice or Liquor which they receive out of the Membrane.

In the said Fig. Between B. C. D. H. I. are represented the exceeding small Branches, with their respective Parts issuing out of the said Branches; and between E. F. and G. there lay a Branch that was almost single, upon which the Painter has also represented the round Part, called growing upon the same. From which Sight we may very well conclude how the Fibrous Parts represented in Fig. 1. are composed, setting aside the Veins and Arteries which run through the same.

A few weeks ago there came two *English* Gentlemen to my House, who askt me some Questions about the Sting of a Flea; but tho I could not then show them the same, yet afterwards it happened, that in dissecting of a Flea, in order to take the Heart out of the Body, the Sting of the said Flea appear'd to me much more plainly than I had ever seen it before; and the more by reason that I had broke off the two Fore-legs, which are as it were join'd to the Head, and then plac'd the fore part of the Flea before the Microscope just as if it lay upon its Back; by which means the Sting of the Flea appear'd so distinctly, that I my self could discover an Orifice in the extrem part of the same, and moreover it appear'd to me that it had a Cavity throughout; but that which surprized me most was, that the Sting of the said Flea had a Scabbard or Sheath, in which the Flea shut up his Sting when he did not use the same, and to preserve it from any hurt, and I imagin that the Flea could so order his Sting with the Case thereof, as to place it between his Legs, that it might not be entangled in his Hair or Wool when he run along.

This Scabbard of the Flea is divid'd into 2 parts, and each of them has a Cavity like a Canal, in order to contain the Sting when those Parts are close shut together; but that which was most remakable to me was, that each of those hollow Parts, that compose the Sheath or Scabbard, was compos'd of Parts like the Teeth of a Saw. These
Teeth,

Teeth, I conclude, are so made as to indent one within another when the Sting is in the Sheath, in order to hinder the opening of the same at any other time than when the Flea would make use of it: Yea, that which is more, we discover that at the end of each of the Scabbards 3 Teeth standing out, which I judge was for no other end than to shut within one another.

I caus'd the Sting with the Sheath thereof, so as they appear'd through the Microscope, to be drawn by my Painter, to the end, that one may comprehend the better the wonderful Figure of this Instrument in so despicable a Creature as a Flea is.

In Fig. 4. L. M. shews the half of the Scabbard of the said Sting, as also the Cavity therein, and the Teeth-like Saws, and the 3 Teeth at the end of it described by M. In the said Fig. 4. N. O. represents the other part of the Sheath, that is likewise adorn'd with the same sort of Teeth. Q. P. is the Sting it self, placed between both the Parts of the Scabbard, and P. represents the little Orifice or Hole, in it.

Now if we suppose that each of the Parts of this Sheath, as also the Sting it self, are furnished with divers Muscles and Fibres necessary to produce all the motions that belong to them, the said Sheath and Sting may be deemed great Instruments, in comparison of those Muscles that produce their Motion: But then if we remove our Thoughts to those *Animalcula* that many millions smaller than a Flea, and consider also their respective Instruments for motion, &c. we cannot but be exceedingly amazed at the thoughts thereof.

Fig: II.

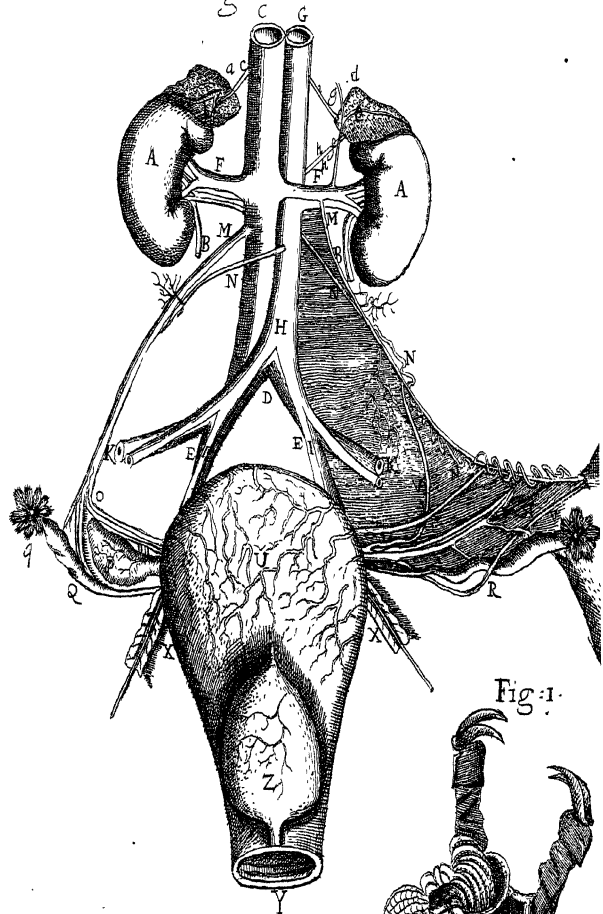


Fig: III.

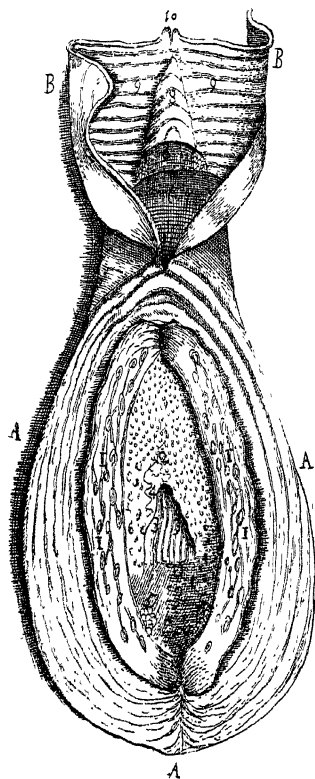
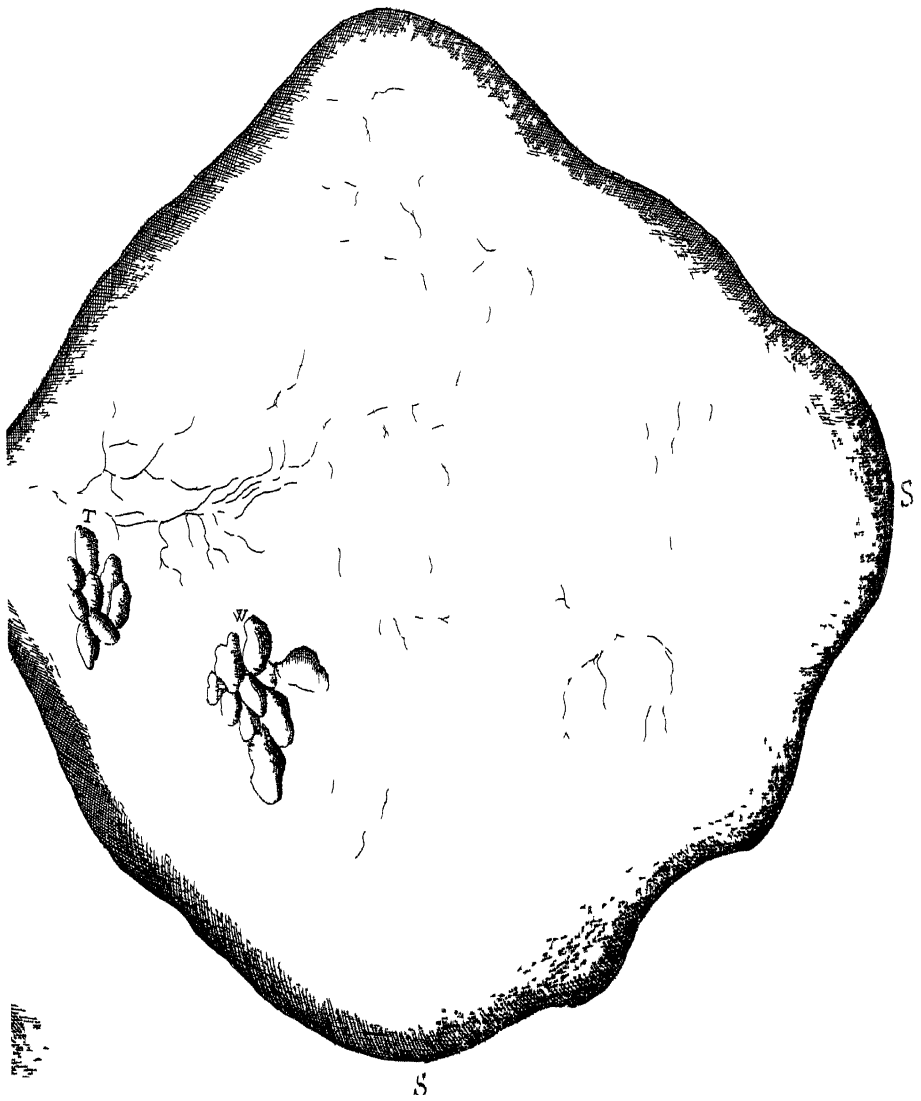


Fig: I.





PHILOSOPHICAL TRANSACTIONS.

For the Months of October, November and December, 1706.

The CONTENTS.

- I. *Part of a Letter from Robert Sibbald, Kt, to Dr Hans Sloane, R. S. Secr. concerning a Second Volume of his Prodrômus Historiæ Naturalis Scotiæ ; with a Description of the Pediculus Cæti, &c.*
- II. *An Account of a Hydrops Ovarii, with a new and exact Figure of the Glandulæ Renales, and of the Uterus in a Puerpera. Communicated by Dr Douglas, F. R. S.*
- III. *An Account of an Experiment made before the Royal Society at Gresham-Colledge, touching the Extraordinary Electricity of Glass, produceable on a smart Attrition of it ; with a Continuation of Experiments on the same Subject, and other Phænomena. By Mr Fr. Hauksbee, F. R. S.*
- IV. *Vindiciæ Matheseos Universalis Gregorianæ contra secundos Abbatis Galloyfii impetus in Historia Acad. Scient. An. MDCCIII.*
- V. *An Account of a Storm of Rain that fell at Denbigh in Wales : Communicated to Dr Hans Sloane, R. S. Secr.*
- VI. *An Observation of a Tumor on the Neck, full of Hydattides, cured by Mr Anthony Hewnden, Surgeon : Communicated by Dr Edw. Tyson, F. R. S.*
- VII. *Part of a Letter from Mr Robert Taylor, to Dr Hans Sloane, R. S. Secr. concerning a Monstrous Birth.*
- VIII. *An Account of Dr Ehm's Treatise of St George's Bath by Landeck, in the Lordship of Glats near Silesia.*

I. *Part of a Letter from Robert Sibbald, Knight, to Dr Hans Sloane, R. S. Secr. concerning a Second Volume of his Prodomus Historiæ Naturalis Scotiæ; with a Description of the Pediculus Cæti, &c.*

Edinburgh, Octob. 3. 1706.

YOU ask in yours about the *Cætologia*: I wrote it indeed in our Language about two years ago; but I find so few here curious of that sort of Learning, I judg'd it better to publish it in *Latin*, in the 2d Volume of my *Prodomus Historiæ Naturalis*, I am now preparing for the Press. There are many wild Plants, and many Minerals to be added, which were not mentioned before; but the Bulk of it will be the *Fishes* and other *Aquatiles*, of which we have many rare and very remarkable: I have several in Plates, and am causing the others to be drawn.

Amongst them is this curious Shell Fish Fig. 1. which Mr Foster, a Regent in the College of *St Andrews*, sent to our College; several of them Le Sips were taken upon the sides of a Whale that was cut in three. Such another was cast in in *Edinburghs Frith* some 30 years ago. I gave a rude description of the Shell of this I got, in my *Aufgaben Musæi Edinburgani*, published Anno 1697. but this is all the Animal in it. We have got the one, as I had the you one. I have sent the figure of it drawn by an Artist; if I had got another, I would have cut this in two, to have seen all the inward parts: but this ought to be kept entire. It is the *Bladder Balanus* *Oceani Septentrionalis adharens* D. Mart. Lister. *Whel.*
the

The *Pediculus Ceti Bocconi*, who, for ought I know, was the first that mention'd it, in his *Recherches & Observations Naturelles*. His Description of the Shell is better than the Figure he giveth of it. I presume to give you my Remarks upon it for want of better, which I must intreat you to take in good part.

The Shell approacheth to a Sexangular Figure, and consisteth of one Valve, in which point it differeth from all the *Balani* I have seen: It hath no Spiral Circumvolutions nor Apex, but it openeth at both ends; the Orifice of the upper end is narrower, and it is through it that it puts forth its *Cirrhi* or *Brachia*. The Orifice of the lower end is much broader, and the Animal is lodged in it. The lower is divided, as *Boccone* observeth, into 18 Lines, which are raised, 12 of them are simple and straight, and the other 6 are branched: The last are so placed, that two straight Lines are betwixt each of them. There is a cavity betwixt all of them, in which the *Cirrhi* or Arms of the Animal are probably placed, tho in this subj^t they stood in the middle of the upper part of the Shell, with their ends contracted as the Figure sheweth them; for the upper Orifice is deeper than the lower. They were altogether within it, but we raised them with the Leg of a Compass to the posture that they appear in the Figure. There is an opening from the under part to the upper, by which these *Cirrhi* mount from the Head of the Animal. The Orifice of the upper part is narrow below, but wide in the middle; and then again contracts somewhat. The Body of the Shell is Convex; it hath 6 divisions, each consisting of 4 Tubes extuberant; which are narrower at the upper end, but grow sensibly wider towards the lower end: The utmost of these Tubes are narrow, the middle are broader, all of them have *Striae* crossing them; the distances betwixt the parts of them are smooth and appear hollow; the Superficies of them are wider at the top and grow narrower sensibly towards the bottom. All the

Tubes

Tubes are hollow in the inside, making cavities betwixt the Lines, both simple and branched, which compose them. They arise from the Orifice in the middle of the inner part of the Shell, and proceed toward the sides of it, the branched part is nearest the side of the Shell. This is what I could observe of the Shell, upon both the outer and inner side of it. To come now to the Animal: In the upper part appear'd like a Mouth gaping; the upper and lower parts were both semicircular, but narrower towards the point of the Overture: They were membranaceous; and took their Rise from the inside of the Shell. The upper Lip, if I may so call it, was altogether membranous, the lower seem'd of an osseous consistence towards the Shell, and appear'd like the *Dentes molares*: A little below the Mouth appear'd the *Cirrhi*, which were continued with the rest of the Body of the Animal. I doubt not but when the Animal is alive, the under part below the *Cirrhi* doth resemble the under part of the *Mollusci* of the Polypode kind: This did resemble the *Parenchyma* of a *Buccinum*, but was much firmer, and when it was press'd it yielded a fat Juice; it was white without, but blackish where it adhered to the Shell; it was all drawn up within the under part of the Shell, which it fill'd: It was somewhat exsiccated, and so I could not perceive any distinction of parts in it, tho some are of opinion there may be *Viscera* and Vessels traced in it when the Animal is newly taken. This is what I could observe of the *Parenchymous* substance in the lower part. You see in the Figure two Sinewy Bodies, which arise from the sides of the upper part of the Shell, the one exactly opposite to the other; they end as it were in two Claws; by these it is like the Animal attacheth it self to any thing; and by these it hung to the Whale; it can dilate and contract them as it pleaseth: So it giveth us a new sort of Creature of the *Polypus* kind, which seemeth to be peculiar to some sort of Whales in our Seas, this being the
second

second cast in upon my Shore in my time, & of which little to be seen in the several Engravings of the Animals at this. I thought this rude account such as it would not be unwelcome to you.

II. *An Account of a Hydrops Ovarii, with a new and exact Figure of the Glandulæ renales, and of the Uterus in a Puerpera. Communicated by Dr Douglas, F. R. S.*

I Lately opened the Body of a Woman, aged 27, who dyed the third day after Delivery, on which I made the following remarks.

1. She measured round the Waist a yard and three quarters, and from the *Scrobiculus Cordis* to the *Os Pubis* a yard and a quarter.

2. All the cutaneous Veins of the *Abdomen* were of a very unusual and extraordinary bigness, and very much distended with blood. From the largest of them, being opened, I extracted several polypous concretions

3. The *Cuticula*, from the *Umbilicus* downwards, was rough and scaly to the naked Eye. In several parts it appeared gangrened, occasioned probably by the thickness of the *Strum* that always oozed out of it, when she scratched the little Pimples or Wheels that broke on its surface; these for some time used to go off without any Scar, but as her strength decayed they became mortified.

4. Upon all the *Regio Epigastrica* the outward Integuments were very thin, little or no fat being visible: But from the upper part of the *Regio Umbilicalis*, down to

the *Os Pubis*, the Skin was almost half an inch thick, of a whitish colour and hard, some of it appearing as if it were granulated, caused by some obstructions in the Mil-
liary cutaneous Glands.

5. The Fat under this part of the Skin did exceed the thickness of an inch, being distinguished into several lob-
ules of an irregular figure, and lodged in so many Cells adhering to the *Membrana aliposa*, which here also was much thicker than it usually is in a natural state.

6. Her Thighs, Legs and Feet were all *Angustiores*, be-
ing extremely big and swelled, easily retaining any Im-
pression made by the Fingers : And her Nurse told me, that she used to wet a great deal of Linnen in drying up the Water, that would always issue out from these parts on the least rubbing, yet all her superiour parts were ex-
tremely lean and emaciated.

7. The fleshy part of the *Abdominal* Muscles was much
extenuated by the great distension, yet their Tendons
were as thick as usual ; and being very easily separable
one from another, I could plainly observe that the Ten-
don of the *Obliquus Internus* adhered firmly to that of the
Transversalis, along the edge of the *Musculus rectus*, and
was not double, as *Realdus Columbus*, and all Anato-
mists after him, down to *Dicmerbrook*, who was first a-
ware of this mistake, have maintained : However, this
straight Muscle derives the same benefit from this situa-
tion being as it were hemm'd in on one side by this firm
adhesion, and on the other by what they call the *Linea*
alba, as if it had indeed been Inclosed between the two
contracted Tendons of the *Obliquus ascendens* ; that is, 'tis
much strengthened thereby in time of acting. I observed
also, that the Tendons of the two oblique Muscles, and
the fleshy part of the *Transversalis*, between the Anteri-
our Spaces of the *Os Ilium* and the *Pubis* near its com-
missure, did inseparably join and unite with one another,
forming as it were a thick and hard border, from the
out-

outside of which there was continued over the Blood Vessels, Nerves and Muscles, on the fore-part of the Thigh, a large *Aponeurosis*, which braced them. The two *Laminae* of the Membrane of the *Abdomen* expanded on its inside. Now this border is what I call the *Ligamentum Pubis*, and what I have in another place supposed to be the firm union of the Tendons of these three *Abdominal Muscles* with the *Peritoneum*.

8. Having periorated the *Abdomen* in the most convenient depending part, for it would have been endless labour, considering the great bulk of the Tumour, to have laid it bare, by freeing it carefully from the Muscles and *Peritonæum*, there issued out with great impetuosity in a rising stream a vast quantity of slimy Viscid Water, in colour and consistence very much resembling a brown, thick and ropy Syrup. This Water measured between 16 and 17 Gallons, besides what was lost on the floor, and imbibed in Sponges and Linnen made use of in drying it up.

9. When the Water was quite empty'd. I find,ed it had been all contained in a duplicature of the *Peritoneum*, and had made a Dropsy in that Membrane, because none of the *Viscera* appeared; for in such a case I have more than once observed, that the inner *Lamella* of that Membrane of the *Abdomen* being separated from the outer, is forced inward by the weight of the Water upon the Bowels, to which it closely adheres, contracting the Guts and Mesentery into a very small volume. But upon a narrower view I perceived that the thick Membrane, including the Water, could be easily separated from the *Viscera*, having freed it from its adhesions by membranous filaments to the *Peritoneum*, and by Blood Vessels to the *Omentum*. Now this Bag reach'd from the *Pubis* to the Midriff, and from the Left Region of the Loins to the Right; in a word, it filled up the whole cavity of the *Abdomen*, distending her Belly so far, that a Plate could easily lye upon it, when alive. Having gradually

fixed it from all the neighbouring parts, and rolled it up, I found it adhered inseparably to the Left *Tuba fallopiana*, the Spermatick Vessels being ramified upon it; and observed the *Ovarium*, which in the other side was naturally disposed, I concluded that the Bag was nothing but the Membrane of the *Ovarium* covering the *Ova* preternaturally thickned and distended by the collection of the above mentioned humour, and that the Distemper was a true *Hydrops ovarii*, inasmuch as all this vast quantity of Water was included in one Bag, being all of the same colour and consistence.

10. All the other *Viscera* in the *Abdomen* were found, and in their natural state.

11. In both Cavities of the Breast there was contain'd a great quantity of reddish Water.

12. The Liquor in the *Pericardium* was very abundant, and of a greenish hue.

13. The Right Lobe of the Lungs was tyed to the Membrane of the *Thorax*, covering the upper part of that cavity, but the Left was free from any adhesion.

14. In the Left Ventricle I found a large Polypous or Serous Concretion, of a round figure, a white colour, and of a pretty hard consistence, with several long Roots of a Red colour, which extended thro the Auricle and Bulb of the Pulmonary Vein into its nearest anastomosis in the Lungs.

Having carried home this large Bag, with the *Uterus* appendant, cut off below the Orifice or the *Meatus Urinarius*, and viewed it at leisure, I observed.

1. That the Right *Spermatick Vein*, which opens into the *Cava* a little below the *Emulgent*, was three times larger than the Left; and from a little above the *Ovarium* it was continued, without any division to its termination.

2. The Right *Ovarium* was in a very natural state. The *Cicatrix* or *Carnuncula*, whence the fecundated *Ovulum*

sem had dropt, was yet remaining, and the
were transfus'd upon this *sem*, in a very pleasant and
best fit manner.

3. The *Tuba Fallopiana*, and its *Fimbria*, were all well
dissected.

4. The *Diaphragmatica* and *Ovarianick* Vein, which
open into the *vena cava* inferior, was much less then
ordinary. And the extraordinary narrowness of the
bore of this Vessel may draw a not very improbable
Reason of some Cause of this Watery Swelling; for the
Blood being hereby hindered in its Reflux to the Heart,
a great deal of *Serum* or *Lympha* thro its slow return, must
needs be thrown off upon the *Ovarium*, already indispos'd,
whence the gradual Increase of the Tumor did pro-
ceed.

5. The two *Spermatick* Arteries were contorted, and
full of turnings and windings, from their meeting with
the Veins to the *Ovaria* and *Tube*.

6. A little below the Kidneys each Artery sent out a
Branch, which was lost on the *Peritoneum*, and fatty
Membrane of the Kidney: And from the same places the
Veins received two considerable Branches.

7. One of the Arteries went off by a narrow Orifice
from the side of the *Aorta*, the other rose up from its
middle, a little below the first.

8. Between the Bag and the *Uterus* all these Vessels
were much dilated, making several Turnings and Cir-
cumvolutions upon the *Peritoneum*, called in this place
the *Ligamentum Uteri latum*.

9. The Left *Tuba Fallopiana* was only remarkable in its
being much longer and larger than usual.

10. In the Bag, which was nothing but the Membrane
called *Dartos*, which covers all the *Vesicular* Glands of
which the *Ovarium* is compos'd, I observ'd several little
Bladders of different sizes, distinct from one another,
which contain'd a limpid or clear slimy *Serum*, in Colour

and Consistence like a Mucilage of the *Semen Cydoniorum*, these were either *Hydatidal* Tumors only, or the Eggs themselves distended. This Liqueur hardened by a slow heat into the Consistence and Colour of the White of an Egg.

11. All the *Fundus Uteri* was about an inch and a half thick, but near the *Collum minus* it grew something thinner, which did proceed from the distention of its Spongy and *Vesicular* Substance, by the Blood in the Vessels running thro it in variety of turnings and windings; so that when it was cut, it very much resembled the substance of the Lungs.

12. Upon the inner Membrane of the *Uterus* I observed, upon wiping it with a Sponge, several little eminencies, which I took to be the Glands mentioned by *Malpighius*, which separate a Humour, to Lubricate and Moisten its cavity.

13. On the upper part of the *Fundus Uteri* I took notice of a great number of small Vessels, like slender Filaments or Threads, running off from its Membrane, and terminating into a reddish and soft spongy sort of substance, not unlike the *Uvula*, bating its colour, which hung down from that side of the Womb in form of a Nipple. These perhaps are the Vessels, which, in the opinion of some, do separate and excern the Matter of the *Lochia* and the *Menses*, they being only visible at those times.

14. Near the beginning of the *Tubes*, I perceived two *Tubercles*, or little Bunchings, about the bigness of a Nut, to which perhaps the *Placenta* was fastned, and to these adhered several Glandules of a Blackish colour, of different sizes.

15. The *Collum minus* was composed, as it were, of two *Labia*, the uppermost was most protuberating, and upon it I observed several small Glands, out of which, upon compression, issued a viscid clear Liqueur, which is
said

said to seal and close up this part, in time of Pregnancy. The lower *Labium* was longer and thinner, its Edges being cut or indented in several places.

16. The *Rugæ* in the lower part of the *Vagina* run as they are represented in Books, but those in the upper part had a quite different course, as they are exactly delineated in the annexed figure.

17. Near the Orifice of the *Meatus Urinarius* there were observable two very large Caruncles, in shape like a Mulberry.

This is what I observed in the opening of this Woman. I come in the next place to relate, as far as I was informed, the Symptoms that accompanied her big Belly, and the Method made use of for her Recovery.

About three years ago, not long after she had lain in of her first Child, she had a violent blow upon the Left side of her Belly, very painful for the present, but in two or three days, upon keeping herself quiet in Bed, the pain and anguish went off. About two months after this, she began to feel some small pains in the Left *Hypogastrick* Region, where she had lately received the Blow; and she observed that side of her Belly to grow abundantly bigger than the other: These pains increased more and more, till they grew very violent, but upon Conception, which was three months after she was first afflicted with them, they went off, and her Belly swelled gradually, as is usual in Pregnancy, having no other Symptoms but what is incident to that state, only she was much bigger than ordinary; and on that account she forbore the use of Medicines, which possibly might have been effectual in her beginning Distemper, had she been well aware of her Danger.

After Delivery, the swelling and bulk of her Belly continued much the same as before the Birth, only upon a plentiful evacuation of the *Lactia* it decreased a little. When her month was up, she advised with several
Phy-

Physians, Apothecaries, &c. who used Emeticks, strong Catharticks, Urinary Dyet-drinks, and all the train of Medicines usually used in a *Dropfy*, her supposed case. And the chief design had, was to prevent the farther Increase of the Swelling while she used them; but, being vain of the trouble and charges to no purpose, she left them off, and then the Tumor increased very rapidly.

Thus she continued about one year, and then she Concaved again, which she suspected by the stoppage of her *Catamenia*, having always been very regular but at such a time. Her Stomach was always good, she never was very thirsty, so drank but little, made Water freely and in great quantity, and was attended with none of the Symptoms of an *Ascites*, except the Swelling of her Belly: Only when she was half gone, her Legs began to swell and pit, growing very big all of a sudden; from these, and likewise from her Belly, there would often issue out a great deal of watery Humour upon rubbing, as I have mentioned already, especially if she scratched the little Pimples, that would often arise in these parts. About this time she began to be afflicted with a difficulty in breathing, with a violent Trembling and Palpitation of her Heart, and to be often subject to great and involuntary Sighings. She was not able to lye down, but was still obliged to sleep in a sitting posture, for fear of being choak'd. Now I think it probable, that all those Symptoms did proceed from the Deluge of Water contained in the Cavities of the *Thorax* and the *Pericardium*; which no doubt did more effectually hasten her end, than the bigness of her Belly, with which she might have lived several years.

After she was brought to Bed of a live Child she became exceeding weak, being unable to fetch her Breath, and complained much of a heavy Load and Oppression on her Breast; and the third day she expired.

The

The Explanation of the Figures.

Fig. 2. Representeth the Glandulæ Renales, the Uterus, with the parts belonging to it, and the large Bag or Membrane of the Ovarium præternaturally distended.

- a **T**he Glandula Renalis on the Right side.
- b An Eminence, or rising in its middle.
- c A Vein that runs from it to the Cava.
- d The Glandula Renalis on the Left Side.
- e A Sulcus or Furrow in its middle.
- f A Vein running from it to the Emulgent.
- g A small Vein that comes from the Diaphragm, and opens into this Vein before it leaves the Gland.
- h h Two small Arteries from the Aorta.
- i i Two Nervous Twigs from one of the Intercostal Plexus's.
- AA The Kidneys.
- BB The Uterus cut off.
- C The Cava cut off.
- D Its Division into the Rami Iliaci.
- EE The Internal Branches into which the Hypogastricks open.
- FF The Emulgent Veins.
- G The Aorta cut off.
- H Its division into the Iliacs.
- II Its Internal Branches, which are spread upon the Uterus.
- KK The external Iliacs of both Vessels.
- LL The Emulgent Arteries.
- MM The Spermatick Veins.
- NNNN The Spermatick Arteries, very much contorted in their Progress, that on the Right side being cut off.

G The Union of the Branches of the Spermatick Vein on the Right side.

P The Right Ovarium, with Blood Vessels ramified on its surface.

Q The Right Uterus.

R The Fundus.

S The Interior of the Left ovary, its Fimbria adhering to the large Bag.

SSS The Membrane of the Left Ovarium, distended to a vast Bigness, with the Blood-Vessels ramified upon it.

T Some of the Ovula grown big.

W Some Hydatidal Tumours on the Inside of the Great Bag.

VVV The Ligamenta lata.

U The Fundus Uteri.

XX The Ligamenta Rotunda; the Membrane that covers them, being laid open, that the Vessels of which they are composed may be viewed.

Y The Vagina cut off.

Z The Vesica Urinaria.

**** A small Artery and Vein on each side, the first going off from the Spermatick, is spread upon the Membrana Adiposa and Peritonæum under the Kidney; the latter bringing back the Blood from these Parts, opens into the Spermatick Vein.

Fig. 3. Sheweth the Vagina and Uterus cut open.

AAA The Fundus Uteri laid open, and its sides folded back.

Fig. 4. The inner Spongy Substance, with the Orifices of the Hysterick Vessels.

22 The Glands appearing on the Inner Membrane of the Uterus.

33 The small Vessels, by which the Lochia, &c. are separated.

4. A soft substance, depending from the Upper Part of the Uterus, into which the foresaid Vessels termin'd.
 5. Two Tubercles, seated near the Beginnings of the Uterus, to which the Placenta adher'd.
- B B** The Vagina laid open.
6. 6. The two Labia of the Collum minusc.
 7. 7. Several small Glands plac'd on the Upper Labium.
 8. The Course of the Rugæ on the upper side of the Vagina.
 9. 9. Their direction on the under side of that part.
 10. 10. Two Orbicular substances, near the Orifice of the Meatus Urinarius.
-

III. An Account of an Experiment made before the Royal Society at Gresham-Colledge, touching the Extraordinary Electricity of Glass, producible on a smart Attrition of it; with a Continuation of Experiments on the same Subject, and other Phenomena. By Mr Fra. Hauksbee, F. R. S.

I Took a Hollow Tube of fine Flint Glass, about an Inch Diameter and 30 in Length, which having rubb'd pretty smartly with Paper in my Hand, till it had acquir'd some degree of Heat; it was then held towards some pieces of Leaf Brass, which so soon as its *Effluvia* had reach'd, became suddenly in Motion, flying towards the Tube, even at 9 or 10 Inches distance; and it seem'd that the hotter the Tube was made by Rubbing, the farther it would Attract, but that it would do so to any Degree of Heat, I dare not determine. And what farther observable was, That sometimes the Bodies Attracted would adhere to the Tube, and there remain quiet: Sometimes would be thrown violently from it to

good Distances: Sometimes in their Motions towards, and sometimes even touching it, they would suddenly be Repell'd back to the distance of 4 or 5 Inches, repeating the same several times with great Velocity in a very surprizing manner. Sometimes the Bodies would move but slowly towards the Tube, sometimes remain a small time suspended between the Glass and the Table on which the Brass Leaf was laid; and sometimes seem to slide along the sides of it without touching. All which *Phænomena*, altho they do not happen at every Tryal exactly as I have here deliver'd them, yet I have sometimes seen them, and in a great measure at all times, are very agreeable to this account, notwithstanding the Force and Vigour of the *Effluviū* is sometimes less than what at other times I have found it. The Reason of which seems to me to proceed from the Different Temperatures of the Air at the time the Experiments are made; for when it happens that abundance of Humid Particles (as sometimes there are) are swimming in the Air, there is no difficulty to believe, but the Resistance of such Particles may mightily impede the Force and Extent of the *Effluviū*: Or, which is much to the same purpose, suddenly Condense on the warm Tube, thereby Hindring or Choaking the Passages of the *Effluvia*. For I find Moistness at all times an utter Enemy to Attempts of this nature; besides, the quality of the *Effluviū* seems to be such, that I could not (in an Experiment lately made) with all my endeavours, cause it to affect one of the premention'd Bodies thro a piece of fine Mullin, notwithstanding it was held very near it, and at the same time would Attract or give Motion to the same Body at three or four times that distance, the Mullin not interposing. Moreover, I cannot tell but the Coldness of the Air at the same time may Concur; for when this Experiment was first made it was Summer time, and Dry Weather; and then it seem'd to me to succeed something better than it has done

done of late : Yet the least of its Performances under the foremention'd Inconveniencies is very notable. But to proceed : When the Glas became hottest by the greatest Attrition, it did then send forth such quantity of *Effluvia*, not only performing the Effects before-mentioned with seemingly greater Vigour, but being nearly apply'd to the Face, or any tender part, might be sensibly felt, as if the Part was pusht with the points of a considerable number of weak Hairs. In this place I think it will not be amiss to take notice, That, considering the Vigorous Action of the *Effluviuum*, I thought it would not be unnecessary to attempt a discovery of the figure of its Motion, by Approaching the Affricated Tube to the flame of a Candle, Smoak, Steem, Dust, and to the Surfaces of Liquids ; which I did without any manner of success : And which I wholly attribute to the reason before given, of the Humid *Effluvia* suddenly Condensing on the Warm Glas ; so the Oleagenous Quality of the Flame and Smoak, the Moistness of the Steam, the Smallness of the Dust, or the *Effluvia* of the Liquids, would immediately adhere to all parts of the Affricated Tube, as it was approacht within their Spheres, preventing the Operation of its *Effluvia*, which then seem'd to be stop't, or retir'd within itself ; and requir'd a new Attrition to give it vent.

What next occur'd in this Experiment was, That upon exhausting the Air from within the Tube by the Pump, then altho the like Attrition or greater was given it than before, yet very little of the *Effluviuum* could be discoverable, by any motion or disturbance given the Leaf Brass, notwithstanding it was held within a quarter of the distance, at which it had been attracted before. After this had been continu'd for some time with little success : I say with little success, Because, sometimes small parts of the Leaf Brass, when the Tube was held near, and at the same time very warm, would
have

have a Motion given them; but without Comparison to what it did when the Experiment was made with it unexhausted of its Air. Besides, I doubt not but some small quantity of Air might be left in the Tube, so that the Attraction to continue in proportion to the Quantity of the remaining Air. Or the Heat that is produc'd upon the smart Attrition of it, may as well in this (as in other Experiments, supply the Effect and Space of such a quantity of that Element: Upon letting in the Air again, it was worth taking notice, That before any new attrition was given the Tube, or was remov'd from the Position and Distance it was held in when *in Vacuo*, that several of the premention'd Bodies at Rest, (as to sence) began suddenly to move, and were some of them attracted to the Tube, which, upon a fresh attrition, its Electrical Quality recover'd as vigorous as at first. Thus far the first part of the Experiment.

Now the Attrition of the Tube being made in the dark, it was very observable, that when the Glass became warm, a Light would continually follow the Motion of the Hand, backward and forward; and at the same time, if another Hand was held near the Tube, a Light would be seen to break from it with noise, much like that of a Green Leaf in the Fire, for smartness, but nothing so loud: Altho when the Experiment has been very silently made, I have heard several Cracks at 7 or 8 feet distance, or more; if any thing else as well as the Hand was brought near it, a Light would fix upon it, notwithstanding it touch'd it not, as I have try'd with Gold, Silver, Brass, Ivory, Wood, &c. giving much the same appearance as the Hand. But after the Glass came to be exhausted of its Air, then upon the first Attrition of it, a much larger did ensue; but the quality of giving a Light to a Body approacht near it, seem'd to be quite lost. I conclude this Experiment with taking notice,

tice, That the Light produc'd upon the Affliction of the Exhausted Tube, appear'd wholly without the Tube, which was discover'd upon the Affliction of it being exhausted, seem'd to be altogether on its outside.

Postscript.

Since this Account was wrote, I procur'd a solid Tube, about the bigness and of the same Metal with the other; but upon tryal of it find no great Difference in its Operations, in comparison with the other, only its *Effluvium* seem'd to continue a little longer, but attracts not at a greater distance than the other that I can discover. With this new Tube I made the following Experiment, I took a little Lamp-black, and having dry'd it on a Paper before the Fire, and the Tube being rubb'd till it was warm, then being held near the Lamp black, it was not without pleasure to behold the Brisk Agitation of a number of the Little Bodies, seeming promiscuously Ascending and Descending with great velocity: And it was admirable to see, that Bodies so light *in specie*, which by their own Gravity falling on Paper would make no sensible noise, yet the same return'd with such force from the Tube, that their striking the Paper was very audible.

*A Continuation of the Experiments on the Attrition
of Glafs.*

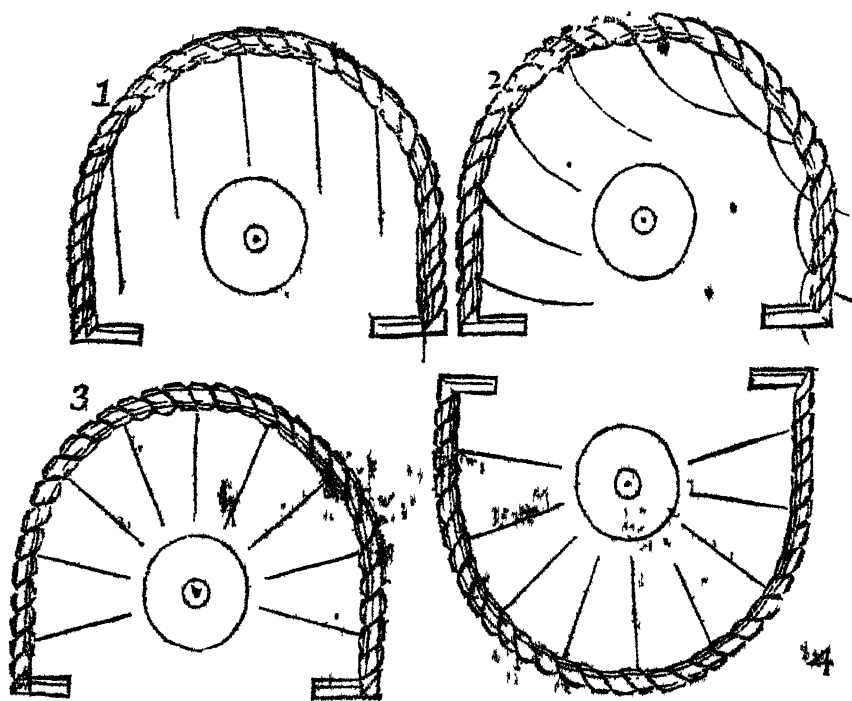
I Present'd a Glafs nearly Cylindrical, of the Length and Diameter about seven Inches each, whose motion was given by a Machine of a new Contrivance ; its Axis lying parallel to the Horizon, which in like Experiments heretofore made, was Diametrically opposite to it. With this new Method, after the Cylinder was exhausted of its Contain'd Air, and the Motion made by the Wheel, it succeeded in respect to the Light produc'd upon the Attrition of it, as in the Experiments formerly mention'd. But when all its Air had return'd into it, and the Attrition and Motion continu'd as at first, it was not a little surprizing to behold from the point of ones Finger to the Glafs, a vigorous Light, which began (as has been observ'd) at the Finger first ; and seem'd to Gravitate on it, being sensibly to be felt there, notwithstanding the Moving Body was not toucht with it by near $\frac{1}{2}$ an Inch : This Light seem'd to issue from the Glafs with a considerable noise, (not much unlike that of Wheezing, but smarter) and was easily distinguishable from that made by the Operation of the Engine, which was not a small one. Here observing the Vigoroufness of the Light, and the Noise that attended the near touching Finger, when the Experiment was made in the Dark, I was willing to satisfy my self whether it would Exhibit any *Phenomenon* by Day light ; accordingly, one day in the Afternoon between 2 and 3 a Clock, in a very light Room, I found that immediately after the Attrition was made on the Moving Glafs, and the Finger approacht as before, a pure Purple Light became very visible to extend itself from the Finger to the Cylinder, and was accompany'd with the like premention'd Noise. This Experiment I have

have repeated several times since at different hours, with the like success: It is always made with Glass exhausted of its Air. To proceed. As to the Electricity of this Body upon such a Motion and Attrition given as usual, I do not find that it exceeds in that quality what already I have related in former Experiments. I then took a piece of fine Muffin, which was sow'd to two Wires bent Archwise, that it might surround the upper surface of the Glass, almost at four Inches distance from it. The Muffin I made as ragged (by breaking the Threads of it every where) as I could, (for I find that Small and Light Bodies are most apt to be affected by the *Effluviu*m of Glass) then the Motion and Attrition being given, it was pleasing enough to see a Multitude of small Sparks of Light every where on the ends of the torn Threads, which resembled so many little Stars observable in a good Telescope in the *Via Lactea*; and the whole was attended with such a whiteness, by the little Light proceeding from them, as in that part of the Hemisphere taken notice of, by those who behold it with the naked Eye.

After that I tryed, whether the Addition of Heat, by placing a red hot Iron just under the Moving Glass, would advance any thing the appearance of Light, which I found without the Attrition of my Hand would do nothing, and with it no more, than I could discover, than it had been absent; both, with the Glass exhausted of its Air and without.

Now what farther I have to add, occur'd from observing that Light Bodies, approach'd near any part of the exhausted Cylinder, would seemingly be equally Attracted, & Gravitate; so that I contriv'd a Semi-circle of Wire, which I could fasten at a constant distance, environing the upper Surface of the Glass at 4 or 5 Inches from it. This Wire was twisted round in some Part Thread, whereby I could with Ease hang

the Threads at pretty nearly equal distances; the lower ends of which reaching within less than an Inch of the Glass, when held approaching the Center of it, but appear'd, when at liberty, as in Figure the 1st.



And when the Cylinder was pretty swiftly turn'd about, whose Threads, would appear by the agitated Air, as in Figure the 2d. But when in the lower part of the Glass was applied any Heat, the Threads would then represent a Form like Fig. the 3d. And from all parts seem to Gravitate, or were attracted in a direct Line to the Center of the moving Body, suffering no Inconvenience or Disorder of Posture by the Motion, as if by the Rapidity of the motion; and by shift-

ing the Attrition, draw them in a Line towards either end of the Cylinder ; yet still pointing to the Axis of it. And if the Wire with the Threads be revers'd, as I have tryed since, that is, encompassing the under part of the Cylinder, as before the upper, it answer'd exactly the same as the other ; the Threads all pointing to the Axis of it: See Fig. the 4th. I have likewise given a Motion to the same Glas in a perpendicular Posture, by which means I had the opportunity of placing a Hoop-Wire Horizontally, with Threads as before, and left only one small part expos'd for the touch of my Fingers between them ; yet the Threads upon the Motion and Attrition given the Cylinder, elevated themselves from their hanging Posture, making all round an Horizontal Plain, directing their loose ends to the Axis as in the other. Now, how far this Experiment may serve to explain the Nature of Electricity, Magnetism, or Gravitation of Bodies, is beyond my Sphere to determine ; but with all Humility submit it to those Learned Gentlemen of this Honourable Society, who have already treated on those Subjects.

IV. *Vindicie Matheseos Universalis Gregorianæ contra secundos Abbatis Galloysii impetus in Historia Acad. Scient. An. MDCCIII.*

Duodecim abhinc annis (a) Jacobi Gregorii, Clarissimi Viri, patrui mei defensionem suscepi contra calumnias Abbatis Galloysii, (b) qui & illum & celeberrimum Barovium, quasi Propositiones suas de *Transformatione Curvarum* a Robervallio surripuerint, apud orbem literatum criminatus est. Plurimis tum argumentis ostendi, quam hæc iniqua esset, imo inepta suspicio. Quandoquidem vero eorum famæ nondum parcit Galloysius, sed eandem denuo litem redintegrat, (c) ne Robervallium stud. ut ait, illustre Parisiensis Academiæ lumen deferere, aut illius honori deesse illo modo videatur, me certe non minus decebit, & meæ Gentis causam agere, & suum Patruo meo decus vindicare, Viri tanti inter Mathematicos nominis, ut si eum cum Robervallio comparem, minime vercar, ne qui utrumque norint, me in illius laude non satis modestum æstiment. At fuerit sano Robervallius, quantum fuisse eum Socii ejus Academici perhibent, imo quantum se Ipse in posthumis suis prædicat, ubi post patris ejus mortem, & obitum, & mortem, at Ego, ait, (d) *in Astronomiam, Geometriam, & Geographiam*

(a) *Philosoph. Transact. Nov. 1701.* (b) *Acad. Reg. Paris. 1701.* (c) *Acad. Reg. Paris. An. 1701.* (d) *Œuvres des Mathématiciens de l'Acad. des Sci.*

*Plura quidem feci quam quæ comprehendere verbis
In promptu mihi sit.*

*Sed illa omnia vulgaria æstimo : Et pergit deinde per paginam sesqui-alteram, nobiliora sua reperta, quæ Jovis auri-
bus servavit, recensere. Hæc inquam hic vir quantum-
vis Egregius, tamen hac sui opinione, hoc fastu inflatus
haudquaquam prospera in Italos omnes Mathematicos
bella intulit, & tam infelicitè ei cessit rerum novarum
studium, ut vix unquam inventum aliquod suum aperire
inceperit, quin idem prius ab aliis vulgatum, ab aliis illius
laudem omnem præreptam jam & occupatam agerrime
videret. Ubi ab Italis Cycloidem acceperat, statim in
illa (e) Trochloidem suam agnovit, miratus quomodo illa ad
Italos pervenerit, eamque a Galilæo ante annos quadra-
ginta inventam sibi asseruit, ita ad eum modestius scri-
bente Torricellio, (f) Quoad Authorem hujus figure cre-
do ego ingenium tuum acutissimum & seracissimum observari
potuisse ostendente nemine ; attamen vivunt adhuc testes qui-
bus olim Galilæus irritas lucubrationes suas communicavit
circa hanc figuram, in eo supersunt adhuc paginae aliquot Cla-
rissimi Mathematici in quibus picturas & aggressiones suas
manuillas circa hoc subjectum jam Adolescentulus delineavit.
Deinde eam communicatum illi a Torricellio ejusdem
Cycloidis centrum Gravitatis haberet, idque pro suo ven-
deret, ita questus est ad Mersennium Torricellius,
(g) Certum est, certo imo certissime scio non habuisse Roberval-
lum autem demonstrationem meam videret, ut Paternitas
vestra vestra, & universa Europa testis esse poterit, &
alia Epistola, & Epistolas, inquit, ad Clarissimum Ro-
bervallium misit, scripsit ad subeundam eandem fortunam*

cum meo centro Gravitatis Cycloidis. Neque hæc eum fefellit suspicio, quicquid enim in iis novum est aut pulchrum (i) sibi & Fermatio assumit, ac ne minimam Torricellio laudem relinquit. Qui itaque cum aliam a se inventam Propositionem Robervallio mitteret (k) *Oro te, inquit, ne inter vestra hanc etiam habeatis, hoc enim esset tollere omne literarum scientiarumque commercium.* Ne quid vero novum aliquis in lucem emitteret quod irreperitum Robervallio fuerit, etiam (l) Clafissimi Cavallerii Methodum Indivisibilium, integro quinquennio antequam ab eo in publicum prodiret, sibi notam & usitatam dicit. Bellum itaque, quod Italis jam diu frustra intentatum fuit, ne miremur ad Britannos demum migrasse; nec quod Galileo, Torricellio, & Cavallerio accidit, id quoque Barovio & Gregorio contigisse nimium ægre feramus. Imo porius miramur cur hoc tam sero contigerit. Septem enim annos post editum Gregorii librum vixerat Robervallius. An vero ille, qui levissimam quamq; gloriolam captavit, qui nihil sibi non arrogavit, nihil cuiquam proprium esse voluit, has sibi propositiones suas cripi vivens videntque pateretur. At non viderat, inquit Galleyfius, per octo annos nihil legerat novum, & omnibus se videntis spectari facile passurus Famæ jam & Mathesi se dedit. Miror quo ore hæc sua proferat commenta, quæ tam facile conargui possunt. Tantum enim abest ut Robervallius ab anno 1668 in secessu & ab studiorum commercio repositus degerit, studiaque deponens inactionem, ut in Academia Parisiensi Mathematicæ professor, & in anno 1670 novæ Statutæ Mathematicæ in Regiâ Academiâ Regiæ communicaret (m) & in hoc anno impressa testantur. Invenit itaque Robervallius Academicorum conventum

si ipse nihil tum legerit, nihil ne tamen de his adeo in Gallia celebratis Gregorii inventis ad illius aures fando pervenit? Nihil horum accepit ab Hugenio (n) qui tam temporis contra Gregorium inter Academicos acerrime disputavit? Vel si nulla illi cum Hugenio, ut Galloysius dicit, familiaritas intercefferat (forte quia præcipuam & maxime utilem suæ Trochoidis proprietatem ab Hugenio inventam fuisse dolebat) nihil a cæteris omnibus Academicis per universum septennium audire potuit. Aut si audisset, nihilne questus esset, ne ipsis quidem Fratribus suis & Amicis? Tam fuisse eum Gloriæ abstinentem haud temere quisquam credet, qui illius cum Italis, cum Suis, cum omnibus rixas intellexerit: aut saltem dicet, quantum ab illo mutatus est, quem modo sic locutum audivimus, (o) *Nam etate aut tempore saltem priores etatis aut temporis beneficiis respiciamus. Et junioribus aut saltem temporis inferioribus, viros adhuc relinquentes? Apagè suam illam in nosmet ipsos injustitiam.* Quod si repente factus est tam patiens, tam tamæ averfus Robervallius, ut sua omnia aliis tribui facile permiserit, quæque feliciter invenit, intra scrinia sua latere, quam in lucem prodire maluerit; qui tandem factum est, ut hæc ab eo sumere potuerit, Gregorius? Videamus quibus argumentis tectus Galloysius hanc criminationem denbo surgere pergat. *Primo, inquit, methodum hanc de transformatione curvarum a Robervallio receptam in Italia ante annum 1668 notam esse debemus, quia Torricellius qui mortuus est An. 1647 in Italia fuisse testatur eam sibi a Robervallio communicatam esse, et hanc methodum cum Gregoriana eandem esse intuitu manifestum sit.* Itaque verisimile admodum videtur, si Gregorius dum in Italia peregrina-

nam, hanc methodum tam diu in Italia cogitamus ab Italis haberi.

Quod Methodus hæc, quæ sub Robervallii nomine præstat, 1691, eadem sit cum illa quam Urbanus Gregorius, non utranque inspicienti satis clarum est, a me ultro concessum fuit. Dixi quidem eam in Cælesti scriptis, ubi Robervallio tribuitur, demonstratione multo & pudendâ vestitam, sed non eandem esse cum Gregoriana nunquam disputavi, nullam ex hac parte litem movere, necunquam in ea præcipuam inter nos questionem versari dicat Galloysius, meque super eâ manus dedisse ferre triumphet. Nondum tamen illi concedo eam vel Italis ante notam esse, vel ab iis Gregorio impertitam. Quomodo enim liquet iis fuisse notam? Quia eam Robervallius cum Torricellio communicavit. Unde vero hæc constat? Ex Epistola ipsius Torricellii. Ubi est hæc epistola? Apud Galloysium. Quando scripta est? Annis abhinc tere sexaginta. Ubi tam diu latuit? Ubi omnia mirabilia latent, in ipsis Robervallii apothecis. An hæc Epistola genuina sit, multo minus an omnino sit, in tanta testimoniorum luce nefas est dubitare. Sed ex quibus literarum monumentis evincitur Torricellium hæc inventa Italis impertitum esse? De hoc altum est adhuc silentium. Vel si cui hæc forte impertiit, poterant tamen iterum excidisse, & penitus fuisse ignota, cum ipse Torricellius viginti jam annis ante Gregorij in Italiam adventum mortuus fuerit. Aut si nondum memoriâ hominum exciderant, dicat si potest Galloysius quis Mathematicorum hæc arcana sibi a Torricellio commissa Gregorio ostenderit. Dicit fortasse (quid enim pro arbitrio suo non dicit) in Italia multis nota esse. An vero Itali Arcana hæc Geometrica quæ per viginti annos nusquam prodire, Gregorio, demum peregrino crederent? An ille in media Italia (Liber enim ejus Patavij impressus est) ausus esset pro suis venditare quæ modo ab Italis didicerat? Vel si fuisset adeo ex-

pers

pers verecundie, hocem tunc p[ro]p[ri]um, sed etiam obadere, sed
 reclauiantibus, sed etiam obadere, sed etiam obadere, sed etiam
 dem hoc non fit veniale sed judicium, sed etiam obadere, sed etiam
 omnia permutio, eruliti, & ignoscant in me, sed etiam obadere, sed etiam
 lixius profectus sim, ut finem aliquando imponere hac
 tam jejuna disputationi, unde nullum ad huc os tractum
 redundare speramus. Stemus vero, si Gallois p[ro]p[ri]um, sed etiam
 ipsius Robervallij judicio; Ipso enim arbitrio huius me-
 thodi Auctor habendus est Gregorius. Robervallus
 enim dum *Cavallerij Indivisibilia* a se inventa in egiro ante
 quinquennio jactitat, *Cavallerio* interim Auctoris Iudem
 relinquit. Ego, inquit, *tanto viro tante & tam sublimis*
doctrinae, mentionem non cripiam; nec possim, nec si possim,
tacere. Ille prior vulgavit, ille hoc jure suum fecit: ille
 hoc jure habeat, atque possideat: ille tandem hoc jure
Inventoris nomine gaudeat. Absit ut in tali causa Inter-
 cessoris ridiculi provinciam mihi suscipiam. Suscepit tamen
 Galloisius. Ac profecto si pergat Illustris illius Academi-
 nici scrinia excutere, & inventa, quae ibi per tot annos
 dormierunt, expurgare, atque in lucem protrahere,
 nescio quousque posthuma crecet laude Robervallus
 aut quid novi ultra nostri ævi Mathematicis reliquum sit,
 quod non pari jure, ac hæc Gregoriana, Robervallio
 demum arrogari possit.

V. *An Account of a Storm of Rain that fell at Denbigh in Wales: Communicated to Dr Hans Sloane, R. S. Secr.*

UPON *Tuesday*, the 16th day of *July* 1706, about eight a clock in the Morning, it began to rain in and about *Denbigh*, which continued incessantly for 30 hours, but not very violently, till about three or four a Clock in the Morning upon *Wednesday*, when it rain'd somewhat faster, attended with a terrible noise (like Thunder) with some flashes of Lightning, and a boisterous Wind. About break of day the Rain and Wind began to abate of their violence, which lessen'd gradually every hour, till about one or two a clock in the afternoon, and then it perfectly ceased, and the Air became clear and somewhat calm.

Upon *Tuesday* the Wind blew South West, but on *Wednesday* it was come to the North West.

The effects of this great Storm were dismal, for it occasioned the overflowing of all the Rivers in *Denbighshire*, *Flinshire* and *Merionethshire*, &c. which spoiled a great deal of Corn, and took off all the Hay that was mowed, near the Banks of the Rivers, which was carryed by the Stream in such vast Quantities down to the Bridges, that it choakt the Arches and outlets insomuch that it broke down above a dozen great Bridges, the building of which in the three Counties above mentioned is valued at some thousands of pounds. Great Oaks

other large Trees were unrooted and swept away, with several Quickset Hedges; and some Quillets by the side of the River *Elmy* so cover'd with Stones and Gravel, that the Owners can't well tell whereabouts their Hedges and Landmarks stood; and the same River has alter'd its course in some places, so as to rob the Landlords on one side of some Acres, and bestowed as much on the opposite side. Two or three Rivulets, that convey'd Water to some Mills, have been so choakt up with Stones and Gravel, that the Owners don't think the Profit will counter-vail the great charge of clearing them.

It is affirmed by a great many people, that the great Floods were not so much the effects of the Rain, as the breaking out of an infinite number of Springs, in such places, as they were never known to flow from before. In the Town of *Denbigh* a great many broke out in the Houses and Stables, especially in that part which lies next the Castle on the North side of it; some of which broke out with a great deal of violence, and in such a quantity, that it is affirmed by several men of the Town, that three of these new Springs, which flowed out of the Stables of the three notable Inns, *viz* the *Bull*, *Cross Keys*, and *Bears Head*, were sufficient to turn any Corn Mill.

At a small distance, Northward of *Denbigh*, lies *Park-Snodiog*, a Rocky Hill, out of which broke out a great many Springs, which flowed so plentifully for nine or ten days, that the Cattel water'd in them for that time; whereas before and after, the people were forc'd to Water them all Summer long at a Well in the High-way, at some distance from this *Park-Snodiog*. There are several deep Holes and Trenches cut in the High-ways adjoining to the River *Elmy*, &c. some so very large, as to hide 3 or 4 Horses, which is not attributed so much to the overflowing of the River, as to the breaking out of Springs in those very places.

In *Comb Mountain* there is a *Pit* of a circular form, which in the Summer time used to have little or no Water in it, and in Winter, as much Water as would swell the Surface to about fourteen or sixteen yards cross over: At present in the midst of Summer it rose up at least a yard and a half higher than it was ever known to do in the course of Winters; and overflowing its Banks, it ran down the Hill with such violence, as to penetrate into the very body of a *Stony Road*, and in this in it, that will bury the biggest Rocks, and the Road, which was a common Highway, is now become impassable.

VI. *An Observation of a Tumor on the Neck, full of Hydatides, cured by Mr Anthony Hewnden, Surgeon: Communicated by Dr Edw. Tyson, F.R.S.*

A Gentlewoman in *London*, aged 25 years, had a large Wenny Tumor, the *Basis* taking its Origin from all the lower hinder part of the Skull, stretching down the Neck near each Jugular, extending it self almost as low as both *Scapula's*; on the upper part was a *Phlegmon*. The *Radix* being so large, I put on a transverse Caustick the length and breadth of the Tumor, intending to separate the *Cutis* from the Membrane of the *Cistis*; but it being so thin where the *Phlegmon* was, oblig'd me to divide the *Cistis*; out of which I sav'd above threescore *Hydatides*, of the bigness of a small Walnut: Several more were broken. These *Hydatides* swum in a Liquor of the consistence of Whites of Eggs. In this *Cistis* I found a large quantity of *Atheromatous* and *Steatomatous* Matter, at the *Base* a large *Sarcoma*; the greatest part I cut off, but fearing to hurt the Muscles of the Neck, deferr'd it to the next day.

intending to take the rest of the *Sarcoma*, and *Radix* of the *Cystis* away by Caustical Medicines, which I applyed with out success, they coming off without making an Ulcer, the *Radix* being of a Consistent substance: searching with my Probe to find the Interstice, it dropt into one; and touching some Membranous or Nervous Body, caus'd the Patient to cry out furiously; into which Interstice I put a piece of the new Vitriol' used for the place, which came out the next day all dissolved with some of the *Radix*: By the continual applying of the Vitriol, I extirpated the whole *Radix*, and healed the whole S. A.

Two Observations belong to this wonder of nature: The one is, Seven years before this Operation, this *Monstr* was very near to big, and almost of itself.

The other is, when I began with Caustical Medicines, the first I used was *Præcip. rub.* which I cover'd the whole *Radix* with, which came off and no Eschar, but it salivated the Patient for 5 weeks.

VII. Part of a Letter from Mr Robert Taylor to Dr Hans Sloane, R. S. Secr. concerning a Monstrous Birth.

Hitchin, April 4. 1706.

LAST week a Woman in a Neighbouring Village being in Strong Labour, the Midwife finding the Birth coming very awkwardly, and more Legs than usual, after a tedious time, delivered the poor Woman of Twins (designed by Nature doubtless) but joyned together; there being but one Trunk of a Body with two Necks, on each a Head, four Arms, two forwards and two back-

wards.

the 3, those backwards crossing each others Shoulders, the two persons side to side : There is but one Navel, two Wrist's, two Fundaments, two pair of Hips, two Elbow's. They had 5, ne the full time having Hair on their Heads, and Nails on their Fingers and Toes. The Midwife tells me they were alive within less than half an hour before Delivered : They look very clear and well. The Children are near ** inches long, and by reason of their being joyned, are about 7 inches over.

VIII. *An Account of Dr Ehm's Treatise of St George's Bath by Landeck, in the Lordship of Glats near Silesia.*

P. 8. **H**E gives an account of this Water, that it fills a Basin of 21 Foot long, 10 broad, and 5 foot deep, every 4 hours.

10. The Smell is a little sulphureous, especially at a distance. The Taste a little sulphureous and saline, but not at all subacid.

11. The Heat is but temperate in Summer, in Winter much greater.

There was Gall in Powder put to the Water, but it did not turn black.

14. *Ol. Tartur. p. Deliquium, Spiritus Salis Armoniaci,* and many Mineral Acid Spirits mixt with it, made no Alteration ; nor did the Solution of fine Silver in *Aq. fort.* make any Change or Precipitation.

27. The Bath-Water is conveyed into a Copper, where it is made to seeth by Artificial Heat, and is afterwards brought into the common Baths to encrease the Heat as the particular Cases require.

2. He

2. He ascribes much virtue to a sort of earthy particles contain'd in the Water. (At this I much wonder, for he seems only to describe a Clay or sort of Pilets Earth, that holds very little Medical Virtue.)

He supposes also a Sulphur and Nitie to be conceal'd in the Water, (but it does not appear in his *Examen Chymicum*) by which Ulcers are heal'd, Coagulations are dissolv'd, relax'd Nerves are strengthened, Scabs and Leprous Affections cured, &c.

The following Chapters give a more particular account of the several Distempers for which these Bathings are used; as also Cautions in what Cases to forbear the use of Bathing.

The warmth of these Waters seems not to exceed the tepid Heat of *Bristol* Well.

It seems strange that they have not Courage enough to try the virtue of these Waters internally; especially since the Contents of these Waters are very few, if any, that are gross or fixt: The Taste is scarce differing from pure Limpid Water; and what is more strange, in his Experiment with the Solution of Silver, he says, they discover'd no precipitation or perturbation of the Waters. whereas we know scarce any Water (except Rain Water) that does not suffer a Change by this Solution, when mixt with it.

L O N D O N: Printed for *Sam. Smith* and *Benj. Hall*,
ford, Printers to the Royal Society, at the *Printers Arms*
in *St Paul's Church yard*.

ERRATA.

Philos Transact Numb. 305 par 2211 line 9 for *small* read *off* p 2213
l. 11. after the Word *Ground* add *above*. p. 2214 l. 7. after the words *and*
dele and. Philos Transact. Numb. 306 p. 2225. l. 6. for *John* read *John*
p. 2226 l. 3. for *John* read *Thomas*

PHILOSOPHICAL TRANSACTIONS.

For the Months of January, February, and March, 1701

The CONTENTS.

- I. *Observations made at Rome, by the late Reverend Mr. John Ray, of the Comet which appeared Anno 1664. Communicated to the Publisher by Mr. Samuel Dale.*
- II. *Æquationum Cubicarum & Biquadraticarum, tum Analytica, tum Geometrica & Mechanica, Resolutio Universalis, à J. Colson.*
- III. *Æquationum quarundam Potestatis tertix, quintæ, septimæ, nonæ, & superiorum, ad infinitum usque per-
gendo, in terminis finitis, ad instar Regularum pro
Cubicis quæ vocantur Cardani, Resolutio Analytica.
Per Abr. De Moivre, R. S. S.*
- IV. *Several Experiments shewing the strange Effects of the
Effluvia of Glass, producible on the Motion and Attrition of it. By Mr. Fr. Hauksbec, F. R. S.*
- V. *Tabula exhibens Cæli tempestates, & mutationes, per
unumquoque die; Item Plagam Ventorum, & Nubium,
Altitudinem Mercurii in Barometro, & Spirituum in Ther-
mometro; & denique Pluvix quantitatem, quæ quibus-
dam diebus, & unoquoque Mense, per Infundibulum
12 pollices latum, apud Upminster in Comitatu Essexiæ
decidebat Anno 1705. Per W. Derham Rectorem Upmin-
sterensem, & S. R. S.*
- VI. *An Account of Balls of Hair taken from the Uterus and
Ovaria of several Women; by Mr. James Yoneg, F. R. S.
Communicated to Dr. Hans Sloane, R. S. Secr.*

I. *Observations made at Rome, by the late Reverend Mr. John Ray, of the Comet which appeared Anno 1664. Communicated to the Publisher by Mr. Samuel Dale.*

December the 20th 1664. S. N.

ABout three of the Clock this Morning, I observed the Comet ; it was in the Constellation of *Hydra*, not far from the Foot of *Crater*. It appeared about the bigness of a Star of the first Magnitude, but nothing so lucid and bright. It had a very long Tail, which pointed almost directly towards the Heart of *Hydra* : The Tail shew'd somewhat like Rays, of a Candle burning in a Mist : The Figure of it was Conical ; the Length of it 5 or 6 Degrees ; the Breadth at the Base not above a Degree and half. The Body of this Comet was about 3 Degrees to the South-East of the most Southerly Star in the foot of *Crater* ; it stood very near in a Right-Line with the two lowermost Stars in the Foot of *Crater*, which are common to it and *Hydra*. See the *Figures*.

December 21. In the Morning, about the same Hour, it was removed about a Degree and half from the Place where it stood, Westward, and a little to the South. The Tail

Tail pointed still towards the Heart of *Hydra*, and appeared 10 Degrees long at the least.

December 22. At the same time it was removed from the Place where it stood the Day before, to the same Point, and about the same distance as the Night before. The Tail of it still pointed to *Cor Hydrae*, or a little thought above it, as the two former Days, and was rather longer than shorter : It also, to my thinking, appeared brighter and larger ; the Body of it being bigger then any Fixt Star, except *Sirius*.

December 23. It was removed to the same Point, and about the same Distance as the Day before ; the Tail of it was as long as ever, and the Comet brighter. The Tail pointed almost directly to *Cor Hydrae*.

December 24, 25, 26. All these 3 Nights were Cloudy, so that I could make no Observations.

December 27. We found it strangely removed from the Place where it was : It was still Westward, and a little to the South, as before. The Body of the Star was still brighter, and the *Coma* about it greater, and more bushy, and yet as long as before ; it pointed almost directly against *Canis major*. The Body of it was among the Stars of *Argo*.

December 28. The same time it was removed above 2 Degrees towards the same Point, and came within 4 or 5 Degrees of the most Eastern Stars in the bright Triangle in the Buttocks of *Canis major*. The Moon shining we could not so well judge, either of the Bigness of the Body, or the length and Bushiness of the Tail.

December

December 29. It was strangely removed, and got before, not the Eastern Star only of the mentioned bright *Triangle*, but also the most Northern: I think, at least, in this last 24 Hours, it had moved 4 Degrees. The *Moon* shining bright, the Tail could not well be observed, yet still it seemed to point directly to *Canis minor*.

II. *Æquationum Cubicarum & Biquadraticarum, tum Analytica, tum Geometrica & Mechanica, Resolutio Universalis, a J. Colson.*

§. I. *Æquationis Cubicæ Universalis* $\left\{ \begin{array}{l} x^3 = 3 p x^2 + 3 q x + 2 r, \\ \quad \quad \quad - 3 p^2 + p^3 \\ \quad \quad \quad - 3 p q \end{array} \right.$

Radices Tres sunt,

$$x = p + \sqrt[3]{r + \sqrt{r^2 - q^3}} + \sqrt[3]{r - \sqrt{r^2 - q^3}}$$

$$x = p - \frac{1 + \sqrt{-3}}{2} \sqrt[3]{r + \sqrt{r^2 - q^3}} - \frac{1 + \sqrt{-3}}{2} \sqrt[3]{r - \sqrt{r^2 - q^3}}$$

$$x = p - \frac{1 + \sqrt{-3}}{2} \sqrt[3]{r + \sqrt{r^2 - q^3}} + \frac{1 - \sqrt{-3}}{2} \sqrt[3]{r - \sqrt{r^2 - q^3}}$$

Ut in *Æquatione Analytica* de his Radicibus fiat, consideremus *Æquationem* $x^3 - 3 p x^2 + 3 q x - 2 r = 0$ in qua esse debet $x = p + m$ Radicem *Æquationis* Radices m erunt $p + 3 m$, & $k = p - m \pm \sqrt{-3} n$.

Ad *Æquationem* quavis Cubicam, inter ejus hujusque *Æquationis* *Universalis* terminos singulos instituenda est comparatio, & sic facillime inveniuntur p, q, r ; & hinc *Æquationis* *Universalis* Radices omnes. *Æquationis* *Universalis* Radices in Numeris.

Æquationis *Cubicæ* *Universalis* Radices, si sit Radix *Æquationis* *Cubicæ* *Universalis* $3 p = 2$, five

(2354)

five $p = \frac{2}{3}$. Secundò $3q - (3p^2) \frac{4}{3} = 3$, five $q = \frac{13}{9}$.

Tertiò $2r (+ p^2 - 3q \times p) - \frac{70}{27} = 4$, five $r = \frac{89}{27}$,

& $r^2 - q^3 = \frac{212}{27}$. Et propterea $x = \frac{2}{3} + \sqrt[3]{\frac{89}{27} + \sqrt{\frac{212}{27}}}$

$+ \sqrt[3]{\frac{89}{27} - \sqrt{\frac{212}{27}}}$. Reliquæ duæ Radices sunt impossibiles.

2. In *Æquatione* $x^3 = 12x^2 - 41x + 42$, erit primò $3p = 12$, five $p = 4$. Secundò $3q - (3p^2) \frac{4}{3} = -41$, five $q = \frac{7}{3}$. Tertiò $2r + (p^2 - 3q \times p) \frac{36}{3} = 42$, five $r = 3$; Et inde $r^2 - q^3 = -\frac{100}{27}$. At Binomii furdi

$3 + \sqrt{-\frac{100}{27}} (= r + \sqrt{r^2 - q^3})$ Radix Cubica, per Methodos ex Arithmetica petendas extracta, est $= 1 + \sqrt{-\frac{4}{3}} (= m + \sqrt{n})$, & proinde Radix $x = (p + 3m = 4 - 2 =) 2$, vel etiam $x = (p - m \pm \sqrt{-3n} = 4 + 1 \pm (\sqrt{4})^2 =) 7$ vel 3 . Vel rursus, ejusdem Binomii $3 + \sqrt{-\frac{100}{27}}$ Radix alia Cubica (tres enim agnoscit)

est $\frac{3}{2} + \sqrt{-\frac{1}{12}} (= m + \sqrt{n})$, & proinde Radix $x = (p + 3m = 4 + 3 =) 7$, & etiam $x = (p - m \pm \sqrt{-3n} = 4 - \frac{3}{2} \pm (\sqrt{\frac{1}{4}}) \frac{1}{2} =) 3$ vel 2 . Vel denuo, ejusdem Binomii $3 + \sqrt{-\frac{100}{27}}$ Radix Cubica tertia est

~~$\frac{1}{2} + \sqrt{-\frac{25}{12}}$~~ $\frac{1}{2} + \sqrt{-\frac{25}{12}}$, $(= m + \sqrt{n})$, & proinde Radix $x =$

(2355)

$x = (p + 2m = 4 - 1 =) 3$, atque etiam $x = (p - m \pm \sqrt{-3n} = 4 + \frac{1}{2} \pm (\sqrt{\frac{25}{4}}) \frac{5}{2} =) 7$ vel 2.

3. In *Æquatione* $x^3 = -15x^2 - 84x + 100$, erit $p = -5$, $q = -3$, $r = 135$; & Binomii $135 + \sqrt{18252}$ Radix Cubica est $3 + \sqrt{12}$. Igitur Radix $x = -5 + 6 = 1$, & $x = -5 - 3 \pm \sqrt{-36} = -8 \pm \sqrt{-36}$, impossibiles.

4. In *Æquatione* $x^3 = 34x^2 - 310x + 1012$, erit $p = \frac{34}{3}$, $q = \frac{226}{9}$, $r = \frac{5536}{27}$; & Binomii $\frac{5536}{27} + \sqrt{\frac{707560}{27}}$ Radix Cubica est $\frac{16}{3} + \sqrt{\frac{10}{3}}$. Igitur Radix $x = \frac{34}{3} + \frac{32}{3} = 22$, & $x = \frac{34}{3} - \frac{16}{3} \pm \sqrt{-10} = 6 \pm \sqrt{-10}$, impossibiles.

5. In *Æquatione* $x^3 = 28x^2 + 61x - 4048$, erit $p = \frac{28}{3}$, $q = \frac{967}{9}$, $r = -\frac{25010}{27}$; & Binomii $-\frac{25010}{27} + \sqrt{-382347}$ Radix Cubica est $\frac{41}{6} + \sqrt{-\frac{243}{4}}$. Igitur $x = \frac{28}{3} + \frac{41}{3} = 23$, & $x = \frac{28}{3} - \frac{41}{6} \pm (\sqrt{\frac{729}{4}}) \frac{27}{2} = 16$ vel -11 .

6. In *Æquatione* $x^3 = -x^2 + 166x - 660$, erit $p = -\frac{1}{3}$, $q = \frac{499}{9}$, $r = -\frac{9650}{27}$; & Binomii $-\frac{9658}{27} + \sqrt{-\frac{1147205}{27}}$ Radix Cubica est $-\frac{22}{3} + \sqrt{-\frac{5}{3}}$. Igitur $x = -\frac{1}{3} - \frac{44}{3} = -15$, & $x = -\frac{1}{3} + \frac{22}{3} \pm \sqrt{5} = 7 \pm \sqrt{5}$, irrationales.

7. In

(2356)

7. In $223477x^3 - 60672x + 995170$,
 $x^3 = 1, 6 = 216, 995170 = 995170$,
 $60672 = 60672$

$135 + 1 = 136$. Igitur $136 = 136$ &

$x = 21 - 103 \pm (1579)2 = 135$.

Nec solum in $223477x^3 - 60672x + 995170$ sed etiam
 in $223477x^3 - 60672x + 995170$ est
 Theorema et modus inveniendi Radix Cubicam
 ipsam Cubicam $223477x^3 - 60672x + 995170$
 plicata de potestate $z^3 = (a^3 + b^3 + 3ab(a+b))$
 $a^3 + 3ab^2 + 3a^2b + b^3$. In $223477x^3 - 60672x + 995170$
 item ejus z^3 $223477x^3 - 60672x + 995170$ $223477x^3$, quo
 est $223477x^3$ Cubicam $223477x^3 - 60672x + 995170$
 terminus secundus $60672x$ $60672x$ $60672x$
 commodum magisq; conueniens $60672x$ $60672x$ $60672x$
 tunc $z^3 = 3qz + 2r$, cuius hinc ipsius $z = 3abz$
 $+ a^3 + b^3$ $3qz + 2r$ $3qz + 2r$ $3qz + 2r$
 hinc ut in huius in
 illam, fiet primo $3q = 3ab$ sic $q = ab$; & se-
 cundo $2r = a^3 + b^3$ sic $2r = (a^3 + b^3)u + q$.
 Et soluta hac aequatione quod $a^3 + b^3 = r + \sqrt{r^2 - q^3}$,
 Et hinc $b^3 = (2r - a^3)u + q$. Atque igitur

in eadem $a = \sqrt[3]{r + \sqrt{r^2 - q^3}}$ & $b = \sqrt[3]{r - \sqrt{r^2 - q^3}}$.
 Et propterea in Aequatione $223477x^3 - 60672x + 995170$

Radix $z = (a + b)u + q$ $223477x^3 - 60672x + 995170$ $223477x^3 - 60672x + 995170$

At verò hæc Radix reuera est $223477x^3 - 60672x + 995170$ $223477x^3 - 60672x + 995170$
 fore quem inducere potest $223477x^3 - 60672x + 995170$ &

$\sqrt[3]{r + \sqrt{r^2 - q^3}}$ $223477x^3 - 60672x + 995170$ $223477x^3 - 60672x + 995170$
 bica triplex est, & quælibet illarum Radix Cubica
 est

est 1, vel $-\frac{1}{2} + \frac{1}{2}\sqrt{-3}$ vel $-\frac{1}{2} - \frac{1}{2}\sqrt{-3}$:

Atque id adeo, propterea quòd harum Radices debet fit

Unitas. Igitur si $\sqrt[3]{1 \times \sqrt{r^2 - q^2}} = \sqrt[3]{1 \times \sqrt{r^2 - q^2}}$ (i.e. $\sqrt[3]{1 \times \sqrt{r^2 - q^2}} = \sqrt[3]{1 \times \sqrt{r^2 - q^2}}$) Ra-

dicem aliquam [quam supra nominavimus $m + \sqrt{n}$, aut $m - \sqrt{n}$,] Cubi $r + \sqrt{r^2 - q^2}$ designet; ipsæ $-\frac{1 + \sqrt{-3}}{2} \times \sqrt[3]{r + \sqrt{r^2 - q^2}}$ & $-\frac{1 - \sqrt{-3}}{2}$

$\times \sqrt[3]{r + \sqrt{r^2 - q^2}}$ [i.e. $-\frac{1 + \sqrt{-3}}{2} \times m + \sqrt{n}$ & $-\frac{1 - \sqrt{-3}}{2} \times m + \sqrt{n}$] alias duas ejusdem Cubi Ra-

dices designabunt. Similiter & $\sqrt[3]{r - \sqrt{r^2 - q^2}}$, $-\frac{1 + \sqrt{-3}}{2} \times \sqrt[3]{r - \sqrt{r^2 - q^2}}$ & $-\frac{1 - \sqrt{-3}}{2}$

$\times \sqrt[3]{r - \sqrt{r^2 - q^2}}$, [i.e. $m - \sqrt{n}$, $-\frac{1 + \sqrt{-3}}{2} \times m - \sqrt{n}$,] tres Cubicæ Ra-

dices erunt Apotomes $r - \sqrt{r^2 - q^2}$. Atque has Radices

debitè connedendo, fiet $z = \sqrt[3]{r + \sqrt{r^2 - q^2}} + \sqrt[3]{r - \sqrt{r^2 - q^2}}$, [i.e. $z = m + \sqrt{n} + m - \sqrt{n} = 2m$,]

$z = -\frac{1 + \sqrt{-3}}{2} \times \sqrt[3]{r + \sqrt{r^2 - q^2}} + \frac{1 - \sqrt{-3}}{2} \times \sqrt[3]{r - \sqrt{r^2 - q^2}}$, [i.e. $z = -\frac{1 + \sqrt{-3}}{2} \times m + \sqrt{n} + \frac{1 - \sqrt{-3}}{2} \times m - \sqrt{n} = -m + \sqrt{-3}n$,] & z

$-\frac{1 - \sqrt{-3}}{2} \times \sqrt[3]{r + \sqrt{r^2 - q^2}} + \frac{1 + \sqrt{-3}}{2} \times \sqrt[3]{r - \sqrt{r^2 - q^2}}$

enda est comparatio, quo pacto citissime inveniuntur ipsæ p, q, r, s ; & hisce cognitâ, non latebit valor ipsius a , ex Theoremate superiori inveniendus, & tum demum manifestentur Æquationis datæ Radices omnes.

Huic Solutioni illustrandæ Exemplum unum addere poteram sufficiat.

1. Æquationis Biquadraticæ $x^4 = 8x^3 + 83x^2 - 162x - 936$ sint Radices extrahendæ. Erit primo juxta præscriptum $4p = 8$, five $p = 2$. Secundò $2q = (4p^2) 16 = 83$, five $q = \frac{99}{2}$. Tertiò $8r = (4pq) 396 = -162$, five $r = \frac{117}{4}$. Quartò $4s = (q^2) \frac{9801}{4} = -936$, five $s = \frac{6057}{16}$. Hinc $p^2 + q = \frac{107}{2}$, $2pr + s = \frac{7929}{16}$, $r^2 = \frac{13689}{16}$, & proinde $a^6 = \frac{107}{2}a^4 - \frac{7929}{16}a^2 + \frac{13689}{16}$. Jam ut Æquatio hæc aliquatenus Cubica in Radices ejus resolvatur, ad Theorema præcedens recurrendum est, in quo erit $p = \frac{107}{2}$, $q = \frac{22009}{144}$, $r = \frac{2903933}{1728}$, & $r^2 - q^3 = -\frac{11940075}{16}$. Atqui Binomii $\frac{2903933}{1728} + \sqrt{-\frac{11940075}{16}}$ Radix Cubica est $-\frac{53}{12} + \sqrt{-\frac{400}{3}}$ & propterea $a^2 = \frac{107}{6} - \frac{53}{6} = 9$, & etiam $a^2 = \frac{107}{6} + \frac{53}{6} \pm (\sqrt{400}) 20 = \frac{169}{4}$ vel $\frac{9}{4}$: Vel quod perinde est, Æquationis præmissæ reverà Cubicæ sex Radices sunt $a = \pm 3$, $a = \pm \frac{13}{2}$, & $a = \pm \frac{3}{2}$, quarum quævis indiscriminatim propo-

(2360)

fito nostro faciet satis. Puta si in præfenti casu fiat $a = 3$, erit juxta Theorema $x = \frac{(p - a +$

$$\sqrt{p^2 + q - a^2 - \frac{2r}{a}} = 2 - 3 \pm \sqrt{4 + \frac{99}{2} - 9 - \frac{39}{2}}$$

$$= -1 \pm (\sqrt{25}) 5 =) 4 \text{ vel } -6, \& x = \frac{(p + a +$$

$$\sqrt{p^2 + q - a^2 + \frac{2r}{a}} = 2 + 3 \pm \sqrt{4 + \frac{99}{2} - 9 + \frac{39}{2}}$$

$$= 5 \pm (\sqrt{64}) 8 =) 13 \text{ vel } -3, \text{ quæ sunt Equationis}$$

datæ Radices quatuor,

2. In Equatione $x^4 = 20x^3 + 252x^2 - 6592x + 21312$, erit $p = 5$, $q = 176$, $r = -384$, & $s = 13072$. Hinc $p^2 + q = 201$, $2pr + s = 9232$, & $r^2 = 147456$; & inde $a^6 = 201 a^4 - 9232 a^2 + 147456$.

Jam in Theoremate pro Cubicis erit $p = 67$, $q = \frac{4 \cdot 35}{3}$,

$$\& r = 65219; \text{ eritque Binomii } 65219 + \sqrt{\frac{38889307072}{27}}$$

$$\text{Radix Cubica } \frac{77}{2} + \sqrt{\frac{847}{12}}. \text{ Igitur } a^2 = 67 + 77 = 144,$$

$$\text{five } a = 12; \& \text{ proinde } x = 5 - 12 \pm$$

$$\sqrt{25 + 176 - 144 + 64} = -7 + (\sqrt{121}) 11 =$$

$$4 \text{ vel } -18, \& x = 5 + 12 \pm \sqrt{25 + 176 - 144 - 64}$$

$$= 17 \pm \sqrt{-7}, \text{ impossibiles.}$$

Hujus autem Theorematis Inventio est hujusmodi. Ex duarum Equationum Quadraticarum $z^2 + 2az - b = 0$, & $z^2 - 2az - c = 0$. in se invicem multiplicando, Equationem conficio Biquadraticam $z^4 = 4a^2 z^2 + b + c$ $\times z^2 + 2ac - 2ab \times z - bc$, cui terminus secundus deest, quamque huic Equationi $z^4 = ez^2 + fz + g$ hanc æquipollere. Unde primo $4a^2 + b + c = e$ five

$$b = e - 4a^2 - c. \text{ Secundò } 2ac - 2ab = f, \text{ hoc est,}$$

$$2ac - 2ae + 8a^3 + 2ac = f, \text{ five } c = \frac{f}{4a} + \frac{e}{2} - 2a^2,$$

&c

& inde $b = (e - 4a^2 - c) - \frac{f}{4} + \frac{c}{2} - 2a^2$. Pro-

tiò $-bc = g$, five $-\frac{f^2}{16a^2} + \frac{c^2}{4} - 2ca^2 + 4a^2 - \dots =$

hoc est, $a^6 = \frac{1}{2} ea^4 - \frac{1}{4} ga^2 - \frac{1}{16} ea^2 + \frac{f}{64}$, quæ

Æquatio quasi Cubica est, ex Radice a^2 & notis vel assumptis e, f, g conflata. Ea verò Radix per Theorema superius exhiberi potest, & eodem Calculo innotescunt ipsæ b & c . At Æquationum $z^2 + 2az - b = 0$ & $z^2 - 2az - c = 0$ Radices sunt $z = -a \pm \sqrt{a^2 + b}$

& $z = a \pm \sqrt{a^2 + c}$, five $z = -a \pm \sqrt{\frac{1}{2}e - a^2 - 4a^2}$,

& $z = a \pm \sqrt{\frac{1}{2}e - a^2 + \frac{f}{4a^2}}$, quæ proinde erunt Radices Æquationis $z^4 = ez^2 + 2z + g$; cognita videlicet a vel a^2 ex Æquatione $a^6 = \frac{1}{2}ea^4 - \frac{1}{4}ga^2 - \frac{1}{16}ea^2 + \frac{f}{64}$. Tum ut

Æquatio ista evadat universalis, & omnia terminis inducta, fac $z = x - p$, eritque $x^4 - 4px^3 + 6p^2x^2 - 4p^3x + p^4 = ex^2 - 2px + p^2e + 2x - 2p + g$,

item & $x = p + a \pm \sqrt{\frac{1}{2}e - a^2 - \frac{f}{4a^2}}$, & $x = p + a \pm \sqrt{\frac{1}{2}e - a^2 + \frac{f}{4a^2}}$. Tandem concinnitatis & compendii gratiâ, fac $e = 2q + 2p^2$ & $f = 8r$; tum $x^4 - 4px^3 + 4p^2x^2 = 2qx^2 - 4pqx + 2p^2q + p^4 + 8rx - 8pr + g$,

$x = p - a \pm \sqrt{p^2 + q - a^2 - \frac{r}{a^2}}$, $x = p + a \pm \sqrt{p^2 + q - a^2 + \frac{r}{a^2}}$, & $a^6 = p^6 + q \times a^4 - \frac{1}{2}g + \frac{1}{4}p^4 + \frac{1}{2}p^2q - \frac{1}{4}q^2 \times a^2 + r$. Denique fac $g = 4s - q^2 + 8p^2 - p^4 - 2p^2q$, & sunt Æquationes præcedentes

$x^4 = 4px^3 + 2qa^2 + 8rx + 4s$ & $a^6 = p^6 - 2pra + r^2 - 4p^2 - 4pq - q^2 + q - s$

Scilicet omnia evadunt ut supra sunt posita.

§ 3. Haftenus de *Æquationum* Cubicarum & Biquadraticarum Resolutione Analytica. Quoniam autem earundem *Eff. &io Geometrica* per Parabolam vulgò tradi solet, & nonnullis in pretio est, ipsam *συνοπτικῶς*, & quidem universalius, non pigebit hic exhibere.

Data *Æquatione* quavis vel Cubica vel Biquadratica, instituenda est comparatio inter terminos ejus, terminosque respondentes hujus *Æquationis*

$$x^4 = \frac{2p}{q} x^3 + \frac{4p^2}{q} x^2 + \frac{2p^3}{q} x + p^4, \text{ quo pacto facile satis}$$

$$\begin{array}{rcccc} \text{--- } 4r & \text{--- } 4l^2 & \text{--- } \frac{2ps}{q} & \text{--- } q^2 \\ & + 2s & + 4rs & \text{--- } s^2 \\ & \text{--- } l & \text{--- } 2q & + t^2 \end{array}$$

eruentur ipsæ p, q, r, s, t ; earum interim unâ aliquâ ut-cunque pro lubitu assumptâ. Tum in Parabola quavis data AVB, cujus Vertex principalis V, Axis V6, & Axi

perpendicularis VT; capiatur VS = p versus interiora Parabolæ, & in angulo SVT inscribatur ST = q, quæ producta Parabolam secet in punctis binis N & O. Biseccetur ON in M, & per M agatur MA Axi parallela & Parabolæ occurrens in A. Ipsi ON parallela ducatur AL, ut sit AL Latus rectum Parabolæ ad Diametrum AM, sitque hæc eadem Unitas. In AL (utrinque si opus est producta) capiatur AG = r, & à puncto G ducatur GR Axi parallela, quæ Parabolam secet in B, à quo capiatur BR = s. A novissime invento puncto R ducatur RE ipsi VT parallela & æqualis, quæ sinistram versus jaceat respectu ipsius R si q sit quantitas affirmativa, at versus dextram si q sit negativa. Atque idem de ipsis AG & BR intelligatur, quæ ad contrarias itidem partes duci debent, si modò valores ipsarum r & s prodeant negativi. Denique Centro E & Radio EC = t describatur Circulus CK^c, qui Parabolam in totidem secabit punctis, quot sunt Æquationis datæ Radices reales. Etenim à punctis istis C, K, &c. ducantur CP, κπ, &c. ipsi ST parallelæ, & ad rectam GR (si opus est productam) terminatæ, eritque harum quævis x, seu Æquationis datæ Radix quæsitæ; eæ scilicet ad dextram jacentes erunt Radices affirmativæ, quæ verò ad sinistram sunt positæ erunt Radices negativæ. Punctum contactûs, siquod fuerit, hic sumitur pro intersectionis punctis duobus ad invicem vicinissimis.

Inter Æquationes Cubicas & Biquadraticas ita constructas hoc tantum intercedit discriminis, quod in prioribus, ob terminum ultimum in præcedente Æquatione deficientem, semper sit $p^3 - q^3 - s^3 + t^3 = 0$, sive $t = \sqrt{s^3 + q^3 - p^3}$. Igitur Centro E & Radio EB ($= \sqrt{BRq + (ERq)STq - VSq}$) descripto Circulo CK^c, Radicum una CP^c in priori constructione in nihilum abit.

Hæc autem demonstrantur ad modum sequentem. Mantentibus jam constructis, & producta CP, si opus est, donec secat AM in H, erit CH Ordinata Parabolæ ad Diametrum

metrum AH, & proinde $CHq = AL \times AH = AH$, ob
 $AL = 1$. At $CH = CP + AG$, & $AH = GB + BP$, &
 propterea $CPq + 2AG \times CP + AGq = GB + BP$; sed
 ob naturam Parabolæ erit $AGq = GB$, unde $CPq + 2AG$
 $\times CP = BP$. Jam à puncto C ad ipsam BP demittatur
 norma s CD, quæ occurrat etiam ipsi EI, ad BP actæ pa-
 rallelæ, in puncto I. Propter similia Triangula CDP &
 TVS, erit $DP = \frac{VS \times CP}{ST}$ & $CD = \frac{VT \times CP}{ST}$, & pro-

inde $CPq + 2AG \times CP = BP = DP + BD = \frac{VS \times CP}{ST}$

+ BR — IE, five $CPq + 2AG \times CP - \frac{VS}{ST} CP - BR$

= — IE. At IEq = CEq — CIq = CEq — CDq

— VTq — 2CD × VT = CEq — $\frac{VTq \times CPq}{STq}$ — VTq

— $\frac{2VTq \times CP}{ST}$ = (ob VTq = STq — SVq) CEq — CPq

+ $\frac{SVq}{STq} CPq - STq + SVq - 2ST \times CP + \frac{2SVq}{ST} CP$,

quæ igitur æqualis erit Quadrato ex Latere CPq + 2AG
 $\times CP - \frac{VS}{ST} CP - BR$. Atque hæc Æquatio ad termini-

nos p, q, r, s, t revocata ipsissima fit Æquatio proposita.

Hinc liquet, quòd eadem quævis Æquatio Biquadratica
 innumeris per Parabolam constructiones sortiri possit, pro
 indefinito valore quantitatis istius, quàm ad arbitrium afflu-
 ni posse jam diximus. Sed casus est simplicissimus faciendo
 $VS = p$ & migrat constructio, si rem ipsam spectes,
 in vulgarem istam, in qua Radicum representatrices
 rectæ CP, &c. sunt ad Axem perpendiculares. Æquatio
 autem fit $x^4 = -4rx^3 - 4r^2x^2 + 4rsx - q^2$, quæ facile

$$\begin{array}{rcccc} & + 2s & - 2q & - s^2 & \\ & - r & & + t^2 & \end{array}$$

construitur ut supra.

§ 4. Sed ne Parabolæ descriptio Organica difficilis nimium videatur, in promptu est Artificium quoddam Mechanicum, ope Fili penduli pondere instructi peractum, cujus auxilio quam exactissime & facillime Aequatio novissima construi potest, & proinde Aequationum quarumcunque Cubicarum & Biquadraticarum Radices inveniri; idque sine ullo linearum ductu nisi Rectarum & Circuli. Constructio autem, quam appellare libet *Mechanicam*, est ad hunc modum.

Contra Parietem erectum, vel planum aliud quodvis Horizonti perpendiculare, ad punctum aliquod F suspendatur filum tenuissimum & flexile FP ; pondere quovis P ad extremitatem P appenso. In hoc filo notetur punctum aliquod N , à puncto suspensionis F satis remotum; vel filo parvulus, si id mavis, innectatur Nodus N . Et sumpta utcunque NO pro Unitate, ad punctum medium A ducatur (in plano prædicto) recta AQ Horizonti parallela, & utrinque quantum satis producta. Hisce generaliter paratis, pro particulari jam applicatione fac $AQ = r$; ipsis q, r, s, t , ut sæpius inculcatum, vel Arithmeticè vel Geometricè, pro datæ cujusvis Aequationis

ex-

quæ erunt *Æquationis* datæ Radices omnes reales; hæ nempe ad dextram erunt Radices affirmativæ, illæ verò ad sinistram Radices negativæ. Demonstratio est manifesta ex præcedentibus, habita tantùm ratione Parabolæ per puncta B, C, c, x, x transeuntis.. Nam posito F foco Parabolæ, (cujus distantia à Vertice est $\frac{1}{2}$ ON,) notum est quod lineæ omnes ut FB + BQ, FC + CD, &c, eandem ubique conficiant summam.

Atque ex principiis hic positis proclive erit Instrumentum haud inconcinnum & quantumvis accuratum fabricari, cujus beneficio hujusmodi *Æquationum* quarumcunque Radices nullo fere negotio inveniri possint, & præ oculis exhiberi. Hoc autem quilibet, si id Curæ sit, variis modis pro ingenio suo efficere potest, & de his jam satis.

III. *Æquationum* quarundam Potestatis tertiæ, quintæ, septimæ, nonæ, & superiorum, ad infinitum usque pergendo, in terminis finitis, ad instar Regularum pro Cubicis quæ vocantur Cardani, Resolutio Analytica.

Per Ab. De Moivre, R. S. S.

Sit n Numerus quicunque, y quantitas incognita, sive *Æquationis* Radix quæsitæ, sitque a quantitas quævis omnino cognita, sive ut vocant Homogeneous Compositionis: Atque horum inter se relatio exprimat *Æquationem*

$$ny + \frac{nn - 1}{2 \times 3} ny^3 + \frac{nn - 1}{2 \times 3} \times \frac{nn - 1}{4 \times 5} ny^5 + \frac{nn - 1}{2 \times 3} \times \frac{nn - 1}{4 \times 5} \times \frac{nn - 1}{6 \times 7} ny^7 + \dots$$

$$+ \frac{nn - 1}{2 \times 3} \times \frac{nn - 1}{4 \times 5} \times \frac{nn - 1}{6 \times 7} \times \frac{nn - 1}{8 \times 9} ny^9 + \dots$$

Ex hujus seriei natura manifestum est, quod si n sumatur numerus aliquis impar (integer scilicet, nec refert utrum sit affirmativus vel negativus) tunc series sponte sua terminabitur, & Aequatio fit una ex supra præfinitis, cujus Radix est

$$(1) \quad y = \frac{1}{2} \sqrt[n]{\sqrt[n]{1 + aa + a}} - \frac{\frac{1}{2}}{\sqrt[n]{\sqrt[n]{1 + aa + a}}}$$

$$\text{vel } (2) \quad y = \frac{1}{2} \sqrt[n]{\sqrt[n]{1 + aa + a}} - \frac{1}{2} \sqrt[n]{\sqrt[n]{1 + aa}} - a$$

$$\text{vel } (3) \quad y = \frac{\frac{1}{2}}{\sqrt[n]{\sqrt[n]{1 + aa}} - a} - \frac{1}{2} \sqrt[n]{\sqrt[n]{1 + aa}} - a$$

$$\text{vel } (4) \quad y = \frac{\frac{1}{2}}{\sqrt[n]{\sqrt[n]{1 + aa}} - a} - \frac{\frac{1}{2}}{\sqrt[n]{\sqrt[n]{1 + aa}} - a}$$

Exempli gratia, fit hujus Aequationis potestatis quintæ $5y + 20y^3 + 16y^5 = 4$ Radix invenienda, quo in casu erit $n = 5$ & $a = 4$. Radix juxta formam primam

$$\text{erit } y = \frac{1}{2} \sqrt[5]{\sqrt[5]{17 + 4}} - \frac{1}{2} \sqrt[5]{\sqrt[5]{17 + 4}}, \text{ quæ in numeris vul-}$$

garibus expeditissime explicari potest ad hunc modum. Est $\sqrt[5]{17 + 4} = 8.1231$, cujus Logarithmus 0.9097164, & hujus pars quinta 0.1819433, huic respondens numerus est

$$1.5203 = \sqrt[5]{\sqrt[5]{17 + 4}}. \text{ Ipsius vero } 0.1819433 \text{ Complementum Arithmeticum est } 9.8180567. \text{ cui respondet numerus } 0.6577 = \frac{1}{\sqrt[5]{\sqrt[5]{17 + 4}}} \text{ Igitur horum numero-}$$

$$\text{rum semidifferentia } 0.4313 = y.$$

Hic venit Observandum quod loco Radicis generalis, non incommode sumeretur $y = \frac{1}{2} \sqrt[n]{2a} - \frac{\frac{1}{2}}{\sqrt[n]{2a}}$, si quan-

do numerus a respectu unitatis, si satis magnus, ut si *Æquatio* fuerit $5y + 20y^3 + 16y^5 = 682$, erit Log. $2a = 3.1348143$, cujus pars quinta 0.6269628, & huic respondens numerus 4.236. Complementi autem Arithmetici 9.3730372 numerus est 0.236 & horum numerorum semidifferentia $2 = y$.

Atqui præterea, si in *Æquatione* præcedenti signa alternatim sint affirmantia & negantia, vel quod eodem redit, si series obvenerit hujus modi

$$ny + \frac{1 - nn}{2 \times 3} ny^3 + \frac{1 - nn}{2 \times 3} \times \frac{9 - nn}{4 \times 5} ny^5 + \frac{1 - nn}{2 \times 3} \times \frac{9 - nn}{4 \times 5} \times \frac{25 - nn}{6 \times 7} ny^7, \&c. = a$$

erit hujus Radix

$$(1) \quad y = \frac{1}{2} \sqrt[n]{a + \sqrt[n]{aa - 1}} + \frac{\frac{1}{2}}{\sqrt[n]{a + \sqrt[n]{aa - 1}}}$$

$$\text{vel } (2) \quad y = \frac{1}{2} \sqrt[n]{a + \sqrt[n]{aa - 1}} + \frac{1}{2} \sqrt[n]{a - \sqrt[n]{aa - 1}}$$

$$\text{vel } (3) \quad y = \frac{\frac{1}{2}}{\sqrt[n]{a - \sqrt[n]{aa - 1}}} + \frac{1}{2} \sqrt[n]{a - \sqrt[n]{aa - 1}}$$

$$\text{vel } (4) \quad y = \frac{\frac{1}{2}}{\sqrt[n]{a - \sqrt[n]{aa - 1}}} + \frac{\frac{1}{2}}{\sqrt[n]{a + \sqrt[n]{aa - 1}}}$$

Hic autem Notandum, quod si $\frac{n-1}{2}$ numerus extiterit impar, Radicis inventæ signum in ei contrarium permutandum est.

Pro

(2371)

Proponatur *Æquatio* $5y - 20y^2 + 16y^3 = 6$, unde
 $n = 5$ & $a = 6$. Erit Radix $= \frac{1}{2} \sqrt[5]{6 + \sqrt[5]{35}}$

Vel quoniam $6 + \sqrt[5]{35} = 11.916$, erit hujus logarithmus 1.0761304 & ejus pars quinta 0.2152561 , Complementum vero Arithmeticum 9.7847439 . Horum Logarithmorum numeri sunt 1.6415 & 0.6091 respective, quorum semisumma $1.1253 = y$.

Verum si acciderit ut a sit minor unitate, tunc Radicis forma secunda, ut quæ proposito est magis conveniens, præ reliquis seligenda est. Sic si *Æquatio* fuerit $5y - 20y^2$

$$+ 16y^3 = \frac{61}{64}, \text{ erit } y = \frac{1}{2} \sqrt[5]{\frac{61}{64}} + \sqrt[5]{\frac{-375}{4096}}$$

$$+ \frac{1}{2} \sqrt[5]{\frac{61}{64} - \sqrt[5]{\frac{-375}{4096}}}$$

Et quidem si Binomialium Radix quintana ullo pacto extrahi queat, prodibit Radix proba & possibilis, etsi expressio ipsa impossibilitatem mentiat.

Binomialis vero $\frac{61}{64} + \sqrt[5]{\frac{-375}{4096}}$ Radix quintana est $\frac{1}{4} + \frac{5}{8}$

$\sqrt[5]{-15}$, & Binomialis $\frac{61}{64} - \sqrt[5]{\frac{-375}{4096}}$ Radix itidem quin-

tana est $\frac{1}{4} - \frac{5}{8} \sqrt[5]{-15}$, quorum Binomialium semisumma $= \frac{1}{4} = y$.

Si autem extractio ista vel non peragi posset, vel etiam difficilior videretur, res ubique confici potest per Tabulam sinuum naturalium ad modum sequentem.

Ad Radium 1 sit $a = \frac{61}{64} = 0.95112$ sinus arcus cujusdam, qui proinde erit $72^\circ. 23'$ cujus pars quinta (co quod $n = 5$) est $14^\circ. 28'$; hujus sinus $0.24981 = \frac{1}{4}$ proxime. Nec secus procedendum in *Æqua*tionibus graduum superiorum.

Several Experiments shewing the strange Effects of the Effluvia of Glass, produceable on the Motion and Attrition of it. By Mr. Fr. Hauksbee, F.R.S.

Experiment I.

Containing farther Observations on the Attrition of Glass.

IN the late Experiments, which seem something to Illustrate Attraction or Electricity, by the Ends of the surrounding Threads pointing to the Axis of the Affricated Glass, there is something farther very Remarkable, and worthy Consideration ; which is, That after the Attrition of the Glass has been a little while continu'd, and the Effluvia laid hold on the hairy or woolly Threads, (for I made use of such as we call Crewel,) that then, notwithstanding the rubbing was eas'd, and the Glass motionless, yet all the Threads would continue their directed Posture for four or five Minutes, and sometimes longer, before they could disengage themselves from the Attracting or Electrical Effluvia. Moreover, if one's finger (or any thing else is as well, for I have try'd divers things,) be approach'd near the pointing ends of the Threads, while the Effluvia act with so much vigour, as to thrust them directed ; that then I say, they would flee and avoid a touch from it ; as if the North Pole of the Magnet was apply'd towards the South Point of a Needle : And at the same time, if the Finger is held near, at about an Inch from the end of the aforesaid Thread, it will there seem

to be attracted, it removing its self something out of its place to the approach'd Body. But if any thing is held between the Glass and the directed Thread, then the Thread immediately looses hold of the Effluvia, and retires to its first Position; yet upon withdrawing the Interpos'd Body, (if it has not remov'd it self too far out of the Reach of the Effluvia) it will again return to its Tendency, and so remain, till the weight of its Body is too great for the declining strength of the Effluvia to support it in such a Direction. I have since try'd the same Experiment with a Globe Glass, which when the Attrition was made, would in all manner of Positions attract the surrounding Threads, directing them towards its Centre.

Experiment II.

Touching the Direction of Woollen Threads every way from the Axis, towards the Circumference of an Affricated Glass.

HAVING Prosecuted the Experiments of Attrition on the outside of Glass with some Success, Several notable Phænomena having been exhibited by them, (and I think what the World in a great measure has not been acquainted withal before,) I thought it would not be amiss to continue them a little farther, by trying what Appearances might be afforded by placing the Woollen Threads, as heretofore us'd on the outside, on the Axis within, and the Attrition to be made on the outward surface as usual; not doubting, if any such Effluvia were by that means emitted within, that then the Threads, which should be fix'd on the Axis, would extend themselves, and point every ways towards the Circumference of it. In order therefore to put it to the issue, I took a Globe Glass about six Inches Diameter, and having convey'd in-

to the Body of it some Woollen Threads ty'd to a stick, which was plac'd in it as an Axis, and being fix'd on the Machine, the great Wheel was turn'd, and the Hand apply'd as usual, but soon I found the Inconvenience of a Glass of that form, the Threads encangling one with another, and there was no way to loose or separate them ; however they seem'd then to me to be dispos'd (had they been at Liberty) to have answer'd my expectation. But this is not all that occur'd at that time, for bringing my Hand near the Glass, which was then at rest, I was surpriz'd to see a Motion of the Bodies within side ; and upon enquiry, found it was occasion'd by the Approach of my Hand, since I could by a motion of my Finger towards the Point of any of the Threads that touched not the inside of the Glass (but nerely so was best) drive it any way ; it seem'd to fly my Finger held on any side of it, and this without touching the outward surface by half an Inch or more. Now when this Experiment was made by hanging the Threads near the outside, it was very odd (as before related) to see them fly the Approach of a Finger ; yet how much more surprizing is it, to see the same perform'd even when a Body so solid as Glass interposes ; which shews the subtilty of the Effluvia, the Body from which it is produc'd seeming to be no Impediment to its motion : Besides it seems very much to resemble or emulate a Solid, since Motion may be given to a Body, by pushing the Effluvia at some distance from it : But what is still more strange is, That this Body (I presume to call it so) altho' so subtil as seemingly to perviate Glass, will not (as I have taken notice of in a former Experiment) affect a light Body thro' a piece of Muslin : Now whether the Muslin absorbs the Effluvium, or what other Laws it may be subject to, I cannot tell, but sure I am 'tis very amazing, and I think, with submission, worthy the Consideration of this Honourable Society.

I have try'd the same with a Glass exhausted of its Air, but it afforded nothing worthy to be taken notice of.

Experiment III.

Being a Repetition and Improvement of the former.

I since procur'd a Glass of a more suitable form for a Repetition of the foregoing Experiment. See *Fig. 1.*

Fig. 1.

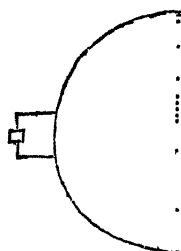
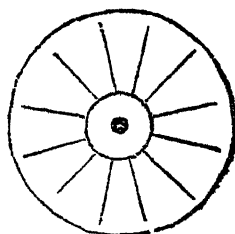


Fig. 2.



This Glass was screw'd by the Neck to one end of a Spindle, and had motion given it by the large Wheel as usual. This manner of fixing, and Figure of the Glass, gave me the Liberty of rubbing it as well within as without, altho' on tryal I find, that either way is much the same; for when the Threads are held within, and the Attrition made on the outside, or the contrary, or the friction made on the same side the Threads are us'd, makes very little difference. To proceed: When the Threads were fix'd on an Axis within, and the Motion and Attrition made as usual the Threads did then represent (as I before expected) a form like *Fig. 2.* And during its resembling that Figure, if a Finger was approach'd near the outside of the Glass, a motion would be given to the point of the Thread nearest it within, and at the same time, if the Threads

were remov'd to the outside, and the Finger held within, the like motion would be given to them there. Generally the Threads seem to fly the Approach of the Finger ; yet sometimes I have seen them jump suddenly towards it, at more than an Inch distance.

To conclude this Experiment ; It is worth taking notice, That the Figures represented by the directed Threads, from, and towards the Centre, not only mimick, but seem most lively to resemble the centripetal, and centrifugal Tendencies of Bodies in their Motions either ways.

Experiment IV.

Shewing, That the Effluvia of Glafs, are Capable of Performing the Office of Attrition ; Causing a Light, by falling on an Exhausted Glafs in Motion, (as if rubbed by the Hand.)

THAT the *Effluvia* of Glafs are very considerable in the Production of divers *Phænomena*, has already been abundantly prov'd ; but that they should act the Part of a Solid Body, by performing the Office of one, is still more admirable ; And that they do so, the following Experiment sufficiently demonstrates, and seems to corroborate a hint I gave in the 2d Experiment of their Emulating such a Body, by causing a Thread to fly the approaching Finger. I took a large Globe Glafs about 9 Inches Diameter, which having exhausted of its Air, I fixt to give Motion to it, by the Machine describ'd in *Philos. Transact.* Numb. 304. its *Axis* standing Perpendicular. Another Globe Glafs about the bigness of the former, was plac'd to give Motion to it by a new Machine, and was wrought with its *Axis* parallel to the Horizon. This last mention'd Globe, with its Content of common Air,

was

was not to move within in Inch, till the Light was
 In these Postures the Machines were set on work, and the
 naked Hand apply'd to the unexhausted Glass, the Effluvia
 at which in a little time reaching the exhausted Glass in
 Motion, immediately produc'd a Light on that part of it
 nearest to the other, without the assistance of a touch
 from any thing else to influence it. This Light is pretty
 vigorous, and extends it self so far on the Globe as the
Effluvia are capable to lay hold on't; It is nothing so
 much of a Purple Colour, as when it is caus'd by the At-
 trition of the Hands; but will continue, or live on the
 Globe for half a Minute or more, after the Motion of the
 rubb'd Glass is ceas'd: But if the rubb'd Glass is kept in
 motion, and the other at rest, the Light instantly dies,
 yet recovers again upon the first motion given it. After
 this I took a long Glass, which had lain by me exhausted
 of its Air for more than six Months: This Glass having
 been rubb'd a little with my Hand to expel the Humidity
 on its outside, I held it over the unexhausted Glass in
 Motion, which at the same time was rubb'd by my Hand:
 It would now and then (for it was not constant) be very
 surprizing to see what large Flashes of Light would be
 produc'd in the long Glass without touching the Glass in
 motion, nor was it self either mov'd or provok'd by any
 immediate Attrition.

V. Tabula exhibens *Cœli tempestates*, & mutationes, ter unoquoque die: Item Plagam *Ventorum*, & *Nubium*; Altitudinem *Mercurii* in *Barometro*, & *Spirituum* in *Thermometro*; & denique *Pluvie* quantitatem, quæ quibusdam diebus, & unoquoque Mense, per Infundibulum 12 pollices latum, apud *Upminster* in Comitatu *Effexiæ* decidebat Anno 1705. Per *W. Derham* Rectorem *Upminsterensem*, & S. R. S.

JANUARIUS.				7	12	9
	Cœlum.	Ventu.	Nut.	barom.	Th.	Pluvie
5	Gelu.	Nb W o	NE	30 14	79	
	Apricum.	I		17	80	
	Nubi'um.			15	87	
10	Gelu cum	W o		21	83	
	Aere casso.	E b S o		22	93	
				25	87	
15	Gelu ferun.	W b N I		00	71	
	& nubilum.	SW o		29 97	85	
	Regelat.			97	95	
20	Gelu & Dies	E I		30 03	73	
	apricus.	E b S I		06	90	
				1, 82		
25	Nebula.	E b S I		29 79	92	0 36
	Clarus.	ESE I		80	103	
	Nubilum.			81	07	
30	Nubilum.	N I	N b E	30 03	87	I.
	Nirgit.	Nb E I		02	97	I II
	Nubilum.			29 99	90	

FEBRUARIUS.

(2279)

FEBRUARIUS

	Cœlum.	Ventus.	Nubes.	Buom.	Th.	Pluvia.
5	Pluvia.	S 2 SEBS.		25 59 77 73	93 152 93	
10	Apricum. Nubilolum. Pluvia.	SSE 1 S 5	SWS	27 81 81 61	97 115 107	
15	Gelu. Apric. tas cum tenui nubula.	NbW 0		30 49 31	84 88	
20	Nubilolum	EbN 2		03 29 97 86	92 107 95	
25	Nubilolum Gelum. Apricum. Pluviosum.	SbE 1 S 2	SSW	28 27 19	81 115 95	
				Sum. Pluviae		1. 5 53

MARTIUS.

6 . 12 . 9

	Cœlum.	Ventus.	Nubes.	Buom.	Th.	Pluvia.
5	Nubilum.	NNE 3	NE	29 61	94	
	Serenum.			65	90	
10	Gelu. Apricum. Nubilum.	S 0 ENE 1	WbN	41 40 40	86 112 90	
15	Pluvia.	E 1	S	24	94	
20	Caliginosum cum Imbri- bus nivosis.	NbE 2		17 65	105 83	
25	Clarius, cum guttulis ni- vosis.	NbW 2		21 33 48	83 104 81	
30	Tumidum & pluvio- sum.	SbW 3 SW 8		35 30 22	116 127 108	1. 5 55

14 R 2

APRILIS

(2380)

A P R I L I S.						
	Cœli.	Ventus.	Nubes.	Barom.	Th.	Pluvia.
5	Pluviosum. Fulgidum. Cæte.	WSW 1 SW 3		29 74 75 66	102 122 120	
10	Pluviosum.	Ed N 1	Sb W	31 32 25	98 117 106	
15	Gelu cum Apricitate. Nubilum.	No		82 90 96	79 116 98	
20	Nubilum.	Wb S 1 W 2		91 92 85	101 134 120	
25	Placidius. Pruna. To- nitru cum Grand. pluv.	W α 1	Nb W Nb W	70 80 87	86 125 117	
30	Sudum & Calidum.	Wb N 1		68 73	100 109	1. 5 15

M A I U S.						
	Cœli.	Ventus.	Nubes.	Barom.	Th.	Pluvia.
5	Dies nubi- lofus.	SWb S 1 Sb W 3		29 61 56 55	115 150 120	
10	Nubilum.	SSW 1 Wb N 2	N W	30 07 05 29 93	104 142 124	
15	Apricum. Imbres Grandinis & Pluvia.	NWb N 2		80 95	92 97	0 22
20	Nubilum.	N 1 Nb E 2		78 78 81	106 124 113	
25	Apricum. Nubilum & Frigidum. Clarius.	Nb E 2 N 2	N N E	85 91 96	93 120 101	
30	Nubilum & Frigidum.	Wb N 1		71 85	98 90	1. 2 03

J U N I U S.

(2381)

JULIUS.						5	12	9
	Cœlum.	Ventus.	Nubes.	Barom.	Th.	Pluvia.		
5	Nubilum & Calidum. Guttæ.	SW 1 NNW 1	W WNW	29 62 65 64	119 143 123			
10	Apricum cum Calore. Nob. l. Pluv.	ESE 2 E b S 2	SE b S	30 03 01 29 94	110 153 126		0	20
15	Nubilum. Apricitas fervida.	W b S 1 2		92 92 93	127 152 132			
20	Nubilum. Fervidum. Minus fervi.	E 1		95 94	125 125			
25	Nubilum. Guttæ. Imber.	SW b W 2 W 3		62 59 50	137 151 131		0	08
30	Nebulæ. Apricitas fervida.	No W 1		84 92 94	106 156 134		1. 2	20

JULIUS.						5	12	9
	Cœlum.	Ventus.	Nubes.	Barom.	Th.	Pluvia.		
5	Apricum. Pluvia. Pluvia.	W 0 NW 2	NW	30 08 08 10	122 139 116		0	32
10	Nubilum. Imber & mi- nus calidum	NbW 3 5		29 79 83 30 00	112 120 118			
15	Apricum. Fervor æstu- osus.	E b S 0 S 2	N	29 96 93 90	112 163 145			
20	Apricitas cum fervore. Nubilum.	SW b W 0 NNW 2		30 03 03 03	115 164 136			
25	Nunc Apri- cum : Nunc Nubilum.	W b S 0 S b W 3	W	29 72 69 66	110 170 148			
30	Apricum. Nubilum. Minus nubil.	W b S 1 SW 2		79 82 82	116 151 135		1. 5	56

AUGUSTUS.

(2382)

AUGUSTUS.						
	Cœlum.	Ventus.	Nubes.	Barom.	Th.	Pluvia.
5	Nubilum. Minus Nubilum.	WSW 1 WbN 1	W	29 82 84 80	133 150 128	
10	Apricum Ventosa. Nubilofum.	SSW 3 SW 6	SW	43 50 44	151 155 136	I 55
15	Turbidum. Nubilofum.	SW 0 SSW 1		97 94 82	109 153 132	
20	Apricum. Guttæ. Minus nubil.	SI	SW	61 65	120 129	
25	Apricum. Guttæ. Minus nubil.	W 1 WNW 6	NW	34 42 49	105 128 117	0 07
30	Malta Pluvia.	SI SbW 4	SSW	68 71 71	127 143 124	I. 12 81

SEPTEMBER.						
	Cœlum.	Ventus.	Nubes.	Barom.	Th.	Pluvia.
5	Nunc Apricum, nunc Nubilum.	SWbW 0 3	WSW	29 88 88 84	107 144 118	
10	Nubilum.	SSW 0	SW sup. NW inf.	77	102	
15	Imber. Nubilum. Nebulofum. Nubilum.	WNW 0 W 1	NbW NW	30 13 15 15	119 145 129	
20	Nubilofum.	E 1 EbN 4		25 25 22	124 138 128	
25	Pluviola.	SWbS 1 SSW 0		29 36 38 40	110 122 113	
30	Pruina & Apricitas.	NW 0 WbN 1		48 50 42	93 112 92	2 04

OCTOBER.

(2383)

OCTOBER.

	Cœlum.	Ventus.	Nubes.	Barom.	Th.	Humid.
5	Nunc In- bre, nu. c Apricum.	S 1 S b W 2		28 53 99 29 10	111 127 111	0 56
10	Nebula crafta. Apricum.	S E 0 E S E 0		93 98 30 05	101 128 108	
15	Nubilum.	WSW 2	W	29 75	98	
	Apricum.			78	108	
20	Apricum. Nubilum. Tonitru, &c.	S E 1 E b S 2 E N E 2	S E b E	2 18 16 22	86 112 108	5 69
25	Apricum & Frigidum.	N 2 3		83 92 30 01	89 103 87	
30	Gelu cum Apricitate.	N b E 2		29 94 30 00	87 80	1 15 71

NOVEMBER.

8

	Cœlum.	Ventus.	Nubes.	Barom.	Th.	Humid.
5	Gelu, & Apricitas. Nubilum.	E N E 1 E b N 1	E	29 08 72 72	83 103 101	
10	Nubilum.	S 2		80	103	
15	Pluviosum. & Gelofum	6		44	120	0 2
20	Apricum. Nebula, &c. Pluv.	N 2 W 1		30 05 29 57 57	80 85 89	
25	Turbidum. Gelu & nebula te- nuis.	9 W 0		35 65 67	98 79 85	0 21
30	Neb. tenuis Nubilum Pluv.	S b W 2 4	S S W	71 10 28 84	70 102 111	5 84

DECEMBER

D. C. M. F.		S. J. P.		P. M.	
5	V. C. C. C.	V. C. C. C.	V. C. C. C.	22	92
	V. C. C. C.	V. C. C. C.	V. C. C. C.	23	172
	V. C. C. C.	V. C. C. C.	V. C. C. C.	1	9
10	V. C. C. C.	V. C. C. C.	V. C. C. C.	45	55
	V. C. C. C.	V. C. C. C.	V. C. C. C.	61	80
15	P. V. C. C.	S. V. C. C.	V. C. C. C.	31	100
	Flut.	V. C. C. C.	V. C. C. C.	37	101
	Flut.	S. I.	V. C. C. C.	51	95
20	Ch. C. C.	S. I.	V. C. C. C.	72	91
	Ch. C. C.	S. I.	V. C. C. C.	73	100
	Ch. C. C.	S. I.	V. C. C. C.	70	84
25	N. C. C. C.	N. C. C. C.	N. C. C. C.	72	94
	Flut.	N. C. C. C.	N. C. C. C.	76	90
	N. C. C. C.	N. C. C. C.	N. C. C. C.	97	88
30	C. C. C. C.	S. E. C. C.	S. E. C. C.	92	87
	C. C. C. C.	S. E. C. C.	S. E. C. C.	90	88
	C. C. C. C.	S. E. C. C.	S. E. C. C.	86	85

*Res in his Tabulis, & Anno 1705. maximè notabiles,
cum Tabularum explicatione.*

TAbulæ meæ ampliores ad Annos 1697-98 & 99, in Philof. Transact. Editæ sunt. Sed quoniam Typographis ingratae fuere, ideo uno vel alio modo compendiosius excusæ sunt, usque ad Annum 1705. Et quandoquidem viris doctis & curiosis, tum indigenis, tum exteris, gratas fuisse comperi, & præcipuè insignissimæ nostræ Societati Regiæ, ideo meum esse existimo pertexere quod exorsus sum. Et ut Doctis usui esse possint, & Typographis non graves, ideo quintum tantum diem cujusque mensis excerpti; quod commodum Anni dabit conspectum.

Non multâ explicatione præter Titulum indigent hæc Tabulæ, nisi in Columnis *Ventorum* & *Nubium* (in q. locus usus sum Notis Anglicanis.) Quippe eorum varias Accuratis non innotuit.

Quatuor Plagæ principales his literis notantur, viz. N. Septentrio: S. Meridies: E. Oriens: W. Occidens.

Plagæ intermediæ harum literarum conjunctione denotantur. E. g. NW. denotat ventum, quem Seneca vocat *Corum*, quem a Solstitiali occidente flare dicit. SW Africum, qui ab occidente hiberno flat, uti Seneca. SBW denotat plagam illam quæ proximè juxta Meridiem sita est: SSW proximam huic: SW b S huic proximam, siue quæ sita est inter hanc & Africum: Et sic de cæteris.

Notæ numerales Ventis adjectæ indicant Ventorum vim. Cyphra [0] notat Aeris tranquillitatem, siue nullum flare Ventum. [1] Ventum adeo languidum denotat, ut candelam accensam viæ extinguere valeat. [2] fortiozem. [7, 8 ad 12, 15 vel 20] denotant Ventos violentos, & magis bacchantes.

Quoad Columnam *Thermometri*, notandum est, *Gelationis* gradum esse circa 85. Sed Pruina eveniet circa 90, vel paulo supra.

In Columnâ *Pluviarum*, aliquando notavi Pluviae pondus, quod in diebus pluviosis (in Tabulâ notatis) decidit. Et in fine cujusque Mensis Summa Pluviae totalis istius mensis notatur. In toto hoc Anno 84,62 Libræ Pluviae deciderunt, istarum Librarum quas Angli *Troy-weight* vocant.

Infundibulum Pluviam recipiens est circulare, cujus Diameter 12 pollicibus Anglicanis æqualis est.

Denique hæc Observationes ter de die facta fuere, nisi absens, vel aliter occupatus essem. Horæ observandi, tum ante, tum post Meridiem, in summitate cujusque mensis notantur.

Circa finem Februarii, & per maximam Martii partem, Nostrates *Dyspnœa*, & *Tussis* ubique fere affecti sunt. Judi-

cent Medici, an hæc proveniant à Ventis orientalibus, unà cum frigida & humida coeli temperie, quod tunc frigidum, non autem glebosum fuisse, hæc breviores, & præcipuè majores meæ Tabulæ ostendunt.

Apr. 1. Mane *Parelia* ab aliis visa sunt ; sed mihi non contigit videre.

Junius mensis adeo fervidus & siccus fuit ut Aquæ defecerint, Fruges languerint, Gramen arefactum fuerit. Drosomelia quoque frequentia fuere. Et Secale ubique uredine tactum.

Aug. 11. Ventus adeo bacchatus est, ut perniciosissimus arborum fructibus, eorumque emptoribus fuerit.

Et quamvis pluvia copiosa successit, tamen Stagna arida fuere in Septembre, & magna Graminis inopia.

Dec. 19. Maximus fuit (ut opinor) *Mercurii in Barometro Descensus* hoc mane ; sequenti modo,

8 ^h $\frac{1}{4}$ mane	—————	28,28 pollices
10	—————	28,06
11	—————	27,94
11 $\frac{1}{2}$	—————	27,94
12 $\frac{1}{2}$	—————	28,03
1 p.m.	—————	28,13
1.10'	—————	18
1.20' Ventus W	7 ———	20
2 Ventus W	9 ———	34

Coeli autem Tempestatumque mutationes non adeo notabiles, ac Mercurij. Tantùm ventus post meridiem vehemens fuit, & noctu multum Pluviae. Sed audivimus calamitosissimam tempestatem Corbili eodem die fuisse.

Hæc maximus Mercurii descensus ab aliis observabatur. In Observatorio Grenovicensi ad 27,80 pollices Mercurius descendebat ; Cantuariæ urbis ad 27,90.

In supputatione Pluviae penè oblitus sum Profunditatem Pluviae notare. Si terra non absorpisset, ad 16,924 pollices

ces Anglicanos ferè exurrexisset. Hic Annus ideo proifico habendus est. Nam proportio Pluviae media singulis Annis est circa 20 $\frac{1}{2}$ pollices *Upminstri*; 42 $\frac{1}{2}$ *Townelez* in comitatu *Lancastriae*; & 22 *Parisis* in *Gallia*; & 24 pollices in urbe *Flandriae* vocatà *Insule*, uti observavi in *Phil. Transf.* N. 297.

VI. *An Account of Balls of Hair taken from the Uterus and Ovaria of several Women; by Mr. James Yonge, F.R.S. Communicated to Dr. Hans Sloane, R.S. Secr.*

IN November 1705, I was call'd to deliver a Woman 30 Years old, who had 4 Days laboured in vain to bring forth her first Child: The Head, being too big for the Passage, stuck immoveable at the *Os pubis*; so that I could neither fasten a Crochet, nor draw it out by a Cupping-Glass fixt to the Scalp with an Air Pump.

In this Extremity I directed my Son to open the Childs Head, and take out all the Brains, with so much of the Skull as he could; and then by a Cord fastned round the Neck with a Nooze, to pull it out, which was soon and easily done.

The Child was Corrupted and stunk much, so did the *Lochia*, which flowed three Weeks; soon after they ceased, the *Menstrua* appeared, and the Woman went abroad: About six Weeks after her Delivery, she was seized with violent Convulsions, and Hysterick Fits, which lasted near three Days; when a painful Tumor arose in the left side of her Belly, which ended in an Eruption of white thick Matter near a Pint, with small Knobs of a Substance like the Yolk of boiled Eggs: All Symptoms immediately vanished, only she complained of the great Hollowness where the Tumor had been.

Four Days after this, the like Swelling appear'd on the right side of her Belly, which continued with a small Flux of Matter about five or six Months, in despite of the many Remedies I us'd to cure her.

About that time there appeared in the *Pudenda* a Bunch of something like greasy Wool, which being drawn forth, proved a Ball, or Wad of Hair, the bigness of a Turkeys Egg, immersed in an Unctuous Slime; adhering on one side to a Membrane so large as the Palm of a Mans Hand: And in the midst of it a small Pyramidal Bone resembling a split Tooth. The Tumor sunk upon this, and the Fluor ceased immediately, and her Lunary Flux (which all this while had not appeared) flow'd as usual, and she continueth in perfect Health ever since, full nine Months.

You will herewith receive the Membrane, (somewhat shrunk and dry,) together with the Bone, and *Folliculus*, to lay before the *R. Society*, whose Sentiments I shall humbly wait to know. The Bone is perfectly such, so is the Hair, being fine, soft, and indifferently strong, of no great length, of a light brown Colour, intangled like a parcel of Combing.

Dr. Hook's
Phil. Col. L.
N. 2.

This Case, though rare and extraordinary, hath sometimes happen'd to others. That Famous Naturalist Dr. Tyson, was both so much oblig'd the World by his Labours and Discoveries, tell us, That in *November* 1679. he dissected a young Centlewoman, and found the right Testicle, or *Ovarium*, swoln into two Bags, almost so big as a Mans Head, full of a pale Serum, in which floated several Lumps of a soft fat Matter, which dissolv'd in part when put into hot Water. One of these Pieces was half so big as a Man's Fist, in which lay a great deal of Hair (as there did though not so plentifully in all the rest) of a Silver Colour, soft, fine, strong, and above two foot long; it was not fasten'd to, nor seem'd to grow from any part, but lay intangled in this Matter, and in it a
Bony

Bony Substance exactly resembling that which is commonly called the Eye or Dog-Tooth.

Another time dissecting a Woman forty Years old, he found near the *Uterus*, a Bag so big as a large Turkey-Egg, and in it a fatty Substance, like that above mentioned, with a great quantity of light soft Hair fastned to a fleshy Substance: Within this *Cystis* a Bone, in some sort resembling a Mandible, having several Sockets, in which were seated there *Dentes Molares*, or Grinder Teeth, and a fourth not yet quite grown out.

The Learned and Inquisitive Doctor *Grew* tells us, That *Mus. R. S.* in your *Museum* lyeth such another Tooth, found by *Dr. Tyson*, after the same manner. And the Doctor himself tells us, *ubi supra*, That the great *Dr. Needham* found a Tooth and Hair in the *Ovarium* of a dead Woman. And *Dr. R. Hook* (whose Death I have a thousand Reasons to lament) saith, That *Dr. Samson* found the like in two great Globose Tumors depending on, or rather parts of the extended *Ovarium*, wrapt up in dissolvable and inflammable fat, of a yellow Colour.

About ten Years since, *Sir Andrew Leake* (who now lyeth in the Bed of Honour) gave me a small Bunch of Hair, being part of what had been found in the Belly of a young Woman at *Deal*, by *Mr. Jos. Nichols* a Surgeon there; I send you that Hair, with a short History of it, by leave from the kind Hand who lately imparted it to me.

A. D. 1696. A Virgin of thircy fell into a Periodical Fever, and afterward a total suppression of her *Menses*; which was soon followed with a Pain and Tumor in the right side of her Belly, which grew and encreased, inuigre all the Remedies advised by the Neighbouring Physicians, till it became bigger and harder than that of a Woman in her last Month. When it had grown a full Year, it began to soften, and then the Censorious People who suspected her Honesty, thought her in a Displea

At fifteen Months end, the Belly was so distended, that it seemed ready to Burst ; which made the Patient desire the Physicians to advise Mr. *Nichols* to make the *Paracentesis* ; but all were surprized, when instead of Water there rush'd out a pint and half of sweet well-digested Matter : The next Day he let out as much more, and then perceived Hair four or five Inches long issue forth with the Matter, but so fastned in the Inside, that he could not pull them out, the Woman complaining he would draw out a piece of her Belly.

She lived but four Days after the Operation ; and on Dissection of her Belly there was found ten Quarts of the same Matter which flowed through the Tap-hole, and in it floating a Lump of Hair so big as an Halfpenny Loaf, wrapt up in a fatty Matter, from which being cleansed, it weighed full half an Ounce. On the Right side of the Womb he found a Protuberance bigger than a large Walnut, from which the Hair grew eight Inches long ; that Tumor, or rather the *Ovary* being separated from the *Matrix*, there was found in it a perfect Dog-Tooth socketted in a Bone of a triangular Figure, in which another Tooth was growing ; the Bone had a *Periostium* on it surrounded with Flesh, fastned at the *Calvaria* to the Skull.

If you desire to see those things, or to have a more particular account of this Dissection, Mr. *Nichols* will oblige you with the same freedom and readiness he hath done your Servant.

My Patient's Case hath two Difficulties in it which I can't get over, *viz.* How these Substances got in where they lodged ? And how they got out thence by the way they did ? Without doubt they were nested in or near the Testicle ; the place of Tumor and Pain, and the many Anatomical Discoveries made by those great Philosophers I have quoted, do ev'n demonstrate it : They could not be conveyed into that Bowel, and must therefore be made

in

in it; but how, and of Materials, is a Question to be put at *Delphos* or *Gresham College*, for *Apollo*, or the *Royal Society* to Answer.

Such Philosophers who call those extraordinary Appearances *Lusus Naturæ*, seem like those of old, who wearied in their Natural Searches by some puzzling Difficulty, take Refuge in Words, ascribing the Cause of Things which they can't discover or discern, to Occult Qualities, &c. If they mean by *Lusus Naturæ*, the Sport or Recreation of Nature, they accuse her who doth nothing in vain, and is the Author of all the Order, Beauty and Benefits we enjoy, as delighting to make Monstrous, Deformed, Useless and Mischievous Things; Things preternatural and contrary to Nature, because destroying its best Works, Man.

If by it they mean that Nature being on the Work of Generation, mistook, failed, or was disappointed; and instead of forming an *Embryo* or *Fœtus*, made a *Chaos*, turn'd into a confus'd Lump of Bone, Fat, Hair and Membranes, the Materials or Elements of Animal Bodies, they greatly err; for in all such Acts of Nature, the Coition of both Sexes is required, according to the old, or either of the new Hypotheses *de Generatione Animal*, which in the Girl of *Deal* was wanting; she being found, upon a very nice and strict Scrutiny of Jealous Eyes, to die a Virgin, and Intact.

We are told by many Authors of the best Credit, That great Quantities of Hair have been found in all the Parts of Humane Bodies, the Fluids not excepted. Dr. *Tyson* did, about twenty Years since, publish a large Collection from them. That Penetrating Eye, beyond the Ken of which scarce any thing in Nature is concealed, reasons like a Philosopher, on the Nature and Production of Hair in Human Bodies, Living or Dead; especially in those Parts we are writing of: but the Teeth and Bones seem too hard, even for so acute an Investigator. He hath indeed given

given us some very fine Thoughts, and Ingenious Conjectures concerning their Origin and Production ; and perhaps he may by this time have discovered more clearly their Causes. If this Paper of mine occasion his divulging those Sentiments, how proud shall I be of the Midwifery !

This is the only Difficulty all those Stories I have told from others are incumbred with ; but mine hath another no less hard to resolve. It's obvious how those things were got out of the Women that dyed ; but my Patient, who survived the Evacuation, puzzleth me to find the *Ductus per Quem* for such a Lump to pass from without the Womb into the *Vulva*. It was certainly lodged without the *Uterus* ; But which way could such a Lump of greasy Hair, with a Bone, and a large Membrane adhering, pass into it ? I know none but the *Tuba Fallopiana* ; but the Orifice of that into the Womb is so small, that it sometimes wont admit an Egg no bigger than a Corn of Pepper to pass : Whence those Conceptions which are made in that Trunk are occasioned. It will distend very largely, so as to hold a big Fœtus ; but where it is inserted to the Matrix, the *Foramen* is too narrow for Substances of such Magnitude to pass, unless some very extraordinary Accident expanded it ; and what that can be, I can't apprehend.

Fig 1.

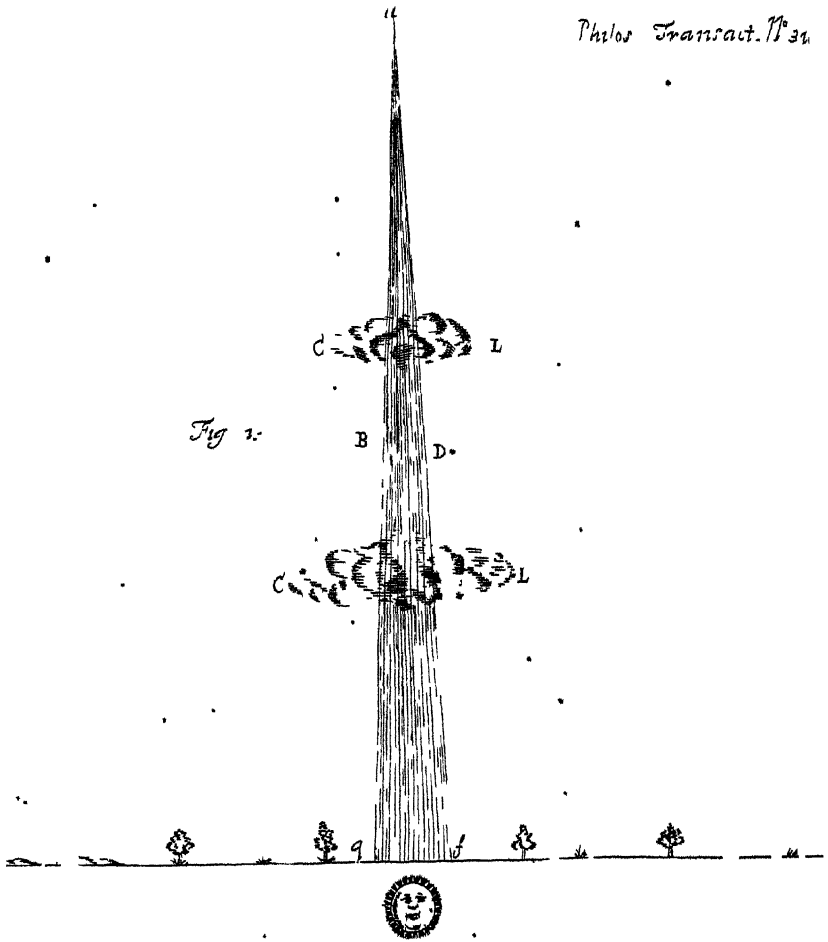
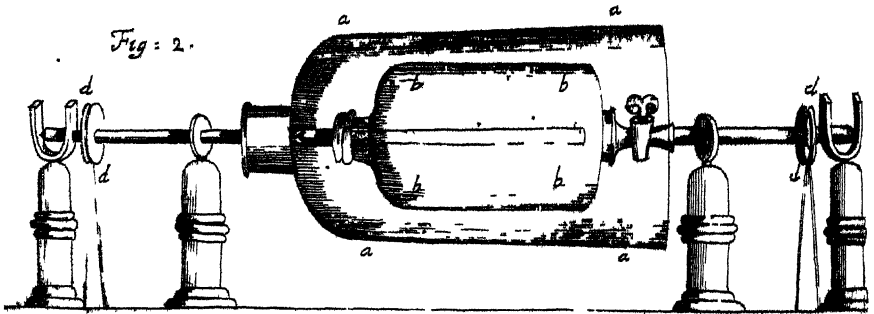


Fig: 2.



PHILOSOPHICAL TRANSACTIONS.

For the Months of April, May, and June, 1707.

The CONTENTS.

- I. Eclipsis Lunaris Tiguri Observata à Joh. Jacobo, & Johanne Schevchzeris, *Fratribus*, M. D. die 17 Apr. 1707.
- II. *An Essay on the Invention of Printing*, by Mr. John Bagford; *with an Account of his Collections for the same*, by Mr. Humfrey Wanley, F. R. S. *Communicated in two Letters to Dr. Hans Sloane, R. S. Secr.*
- III. *An Account of a Pyramidal Appearance in the Heavens, observed near Upminster in Essex*, by the Reverend Mr. William Derham, F. R. S.
- IV. *An Account of an Experiment, confirming one lately made, touching the Production of Light, by the Effluvia of one Glass falling on another in Motion.* By Mr. Fr. Hauksbee, F. R. S.
- V. *An Account of an Experiment made before the Royal Society at Gresham College, May 26. 1707. Touching the Difficulty of Separating two Hemispheres, upon the injecting of an Atmosphere of Air on their outward Surfaces, without withdrawing the included Air.* By Mr. Fr. Hauksbee, F. R. S.
- VI. *Some Natural Observations made in the Parishes of Kinardsey and Donington in Shropshire*, by the Reverend Mr. George Plaxton. *Communicated by Mr. Ralph Thoresby, to Dr. Hans Sloane, R. S. Secr.*
- VII. *An Account of the Cape of Good Hope*, by Mr. John Maxwell. *Communicated by the Reverend Dr. John Harris, F. R. S.*
- VIII. *Epistola, in qua ratio redditur Libri nuper editi, cui Titulus, De Arthritide Anomala, sive Interna, Dissertatio, Auctore Gail. Musgrave, M. D. Coll. Med. Lond. & Reg. Societ. Socio.*
- IX. *An Account of a Book, intituled, The Whole Art of Husbandry, &c.* By J. M. Esq; F. R. S.

I. Eclipsis Lunar^{is} Tiguri Observata a Joh. Jacobo,
 & Johanne Schevcheris, Fratribus, M. D. clvii
 17 Apr. 1707.

H. Min. S.

12 grad 18

18 40

20 15

23

25 20

27 40

29

29 20

29 30

30 30

31 40

33

34

35

36 40

37 20

37 30

37 40

38 40

39 30

41

43 40

45

45 20

46 30

48 40

51 30

52 40

PEnumbra ex parte Maræotidis:

Umbra vera intra discum.

Palus Maræotis in Umbra.

Maris Eoi principium.

Mons Alabastrinus. Medium Maris Eoi.

Principium sinus Sirbonii.

Medium sinus Sirbonii, & Mare Ægyptiacum.

Principium insulæ Cercinnæ.

Lacus Meridionalis.

Medium Cercinnæ.

Finis Cercinnæ.

Extrema protensio Montis Sophæ.

Insulæ inter Siciliam & Cercinnam.

Principium Mauritanîæ, & sinus Hyperborei.

Medius sinus Hyperboreus.

Mare Pamphilium.

Creta.

Principium Ætnæ.

Medium Ætnæ. Melos. Carpathos.

Finis Ætnæ.

Rhodus.

Initium Sinai.

Medium Maris Adriatici, & Sinai.

Sinai Finis.

Medium Adriatici.

Principium Propont. & Maris Hyperborei.

Medium Propontidis, & finis Adriatici.

Principium Lacus nigri majoris.

H.	Min.	S.	
12	53	10	Lacus Thrasumenus.
	53	30	Medium Lacus nigri minoris.
	54	30	Principium Insulæ Besbyci.
	55	10	Principium Ponti Euxini in sinu Salmydesso.
	56		Finis Propontidis.
	57	30	Ponti Euxini inferioris principium.
	58		Byzanzii principium.
	59	10	—— finis.
	59	40	Promontorium Acherusium.
	1		Borysthenis principium. Apollonia.
	1	30	Medium Ponti Euxini.
	3	20	Sinus Atheniensis Medius.
	4	40	Palus Byccs.
	5	40	Promontorium Heracleum.
	7	40	Cochilis media. Finis finus extremi Ponti.
	8	30	Lacus Corocondæ Medium.
	9	20	Promont. Herculi. & Maris Caspii initium.
	11	40	Initium Paludis Amadocæ.
	16	20	—— Medium.
	18	10	—— Finis.
	20		Paludes amaræ, & Lacus minor.
	20	40	Lacus major.
	22	10	Tenuissimus margo lucidus.
	23	20	Lunæ corpus totum in umbra.
	24	40	Discus Lunæ integer ferè, excepto Mari.
			Mediter. diluto quodam fulgore splendet,
			ut Maria distinguantur per Tubum.
	40		Alia macula præter paludem Mæotidem
			per tubum distinguere nequit.
	45		Lunæ Discus medius magis magisque obscu-
			ratur, ambitu manente lucidiore.
2	12		Discus Lunæ Rutilo colore nudo oculo re-
			fulgebat, nec per Telescopium macula
			ulla distinguere potuit.
	15		Totus Discus obscurior magis, & magis,
			Peripheriâ manente lucidiusculâ.

H. Min. S.

2	28	Splendidior Discus è regione Paludis Maræotidis, umbraque densissima versus Paludem Mæotidem.
	33	Sensim lucidior reddit. integer Discus, obcurrit. majore tegente Paludem Mæotid. ejusq; loca vicina.
	51 40	Redeunt sensim vestigia Marium.
	56 30	Pontus Euxinus, & Mare Caspium, in mediâ obscuratione manent veluti nebulâ crassâ perfusa.
3	5	Distingui potest Mare Eoum, & vicina, ut ut Luna nondum ex umbra Emerferit.
	9 40	Emerfionis initium verum.
	11 30	Incipit emergere Palus Maræotis.
	13	† valit.
	15 40	Incipit Mare Eoum.
	21 30	Evasit sinus Sirbonius, & Mare Ægyptium.
	26	Evasit Cassiotis Regio, & aliquot minuta ante Cercinna insula.
	27 40	Evasit Athos Mons, & Maltha.
	31	Emerfit Mauritania.
	38	—————Corsica, & Sicilia.
	44	—————Mare Adriaticum.
	45 20	—————Media Propontis.
	49	—————Besbycus.
	52	—————Byzantium.
	57 30	—————Promontorium Acherusium.
	5 20	Emerfit Pontus Euxinus, & medium Caspium.
4	6	Incipit Mæotis Palus.
	9	Emerfit Caspium, & Media Mæotis.
	11 20	Emerfit Mæotis.
	13 40	Penumbra.
	14 20	Luna tota integra.

In Emerfione videbatur mihi umbra distinctior,
quam in immerfione,

12	18	40	Eclipseos initium in umbra vera.
1	23	20	Obscuratio maxima.
3	9	40	Emerfionis initium.
1	46	30	Duratio totalis obscurationis.
4	14	20	Emerfionis finis.
3	55	50	Tota Duratio.
1	5	40	Ab initio ad Immerfionem Lunæ totalem.
1	5	40	Ab emerfione totalis Eclipseos ad finem.

- II. *An Essay on the Invention of Printing*, by Mr. John Bagford; with an Account of his Collections for the same, by Mr. Humfrey Wanley, F.R.S. Communicated in two Letters to Dr. Hans Sloane, R. S. Secr.

THE Antiquity of Printing, and the first Inventors, hath been treated of by many Authors: I shall now only give a short account of the Observations I have made in many Years from old Books of several sorts and kinds. The general notion of most Authors is, that we had the hint from the *Chineses*; but I am not in the least inclined to be of that Opinion, for at that time of day we had no knowledge of them. I think we might more probably take it from the Ancient *Romans*, their Medals, Seals, and the Marks or Names at the bottom of their Sacrificing Pots, which Antiquities we had amongst ourselves in *Europe*, rather than fetch it so far. But if it be certain, that Cards are as old as our King *Henry VI.* nothing that I have seen or considered of, seems to give so fair an hint for Printing, as the making of Cards; as it is evident by the first Specimen of Printing at *Harlem*, and by some Books in the *Bodleian Library* at *Oxford*, one in *Junius's* Collection, another in Archbishop *Laud's*, and a third in the same, being the Lives of the *Russian* Saints in a thin Folio; the Leaves are not pasted together as the former two, but cut on Wooden Blocks, and illuminated. There is also another rare Specimen of the first in that valuable Collection of Archbishop *Parker*, in *Bennet College Library* at *Cambridge*, bound up with a MS. Book; this was shown me at first by Mr. *Bullord*, and differs very much from them at *Oxford*; it is the *Life of Christ* in Figures

gures, or rather the Types of the Old and New Testament. They have not so many Specimens of the first Printing at *Harlem*, as we have in *England*; and if I can obtain the favour of either University, I will give you a Specimen of two or three, as exact as they are printed. I am apt to believe, that if some curious Persons had the Liberty of looking over the Libraries in both Universities, and that in *Gresham* College, their might be found other Specimens of the Antient Printing; the aforementioned Books being taken notice of but of late.

The Cutting of the Molds or Blocks for making our Playing Cards, is after the same manner as those for the Books printed at *Harlem*. They lay a Sheet of moist or wet Paper on the Form or Block, being first lightly brush'd over with Ink, made of Lamp-black mix'd with Starch and Water: Then they rub it off with a round Lint with their hand, which is done with great Expedition; this is for Picture or Court Cards: Then they paste them together threefold, the courtest in the middle. They colour them by the help of several *Patterns*, or *Stanesfiles*, as they call them; they are Card Paper cut thro' with a Penknife, for every Colour, as Red, &c. (for at the first Printing, the Card has only a meer Out-Line :) These Patterns are Painted with Oyl-Colours, to keep them from wearing out with the Brushes; they lay it upon the Picture, and by sliding a Brush that is full and loose gently over the Pattern, it fixes the Colour into the cut Holes, and leaves it on the Print that is to be a Card, and so go through all the Colours you see on Cards; but this cannot be so well understood by a Description, as by seeing them perform it. This I humbly conceive to be their way of Printing first at *Harlem*, and those Books abovementioned. This methinks might have been considered before this time of Day, if they would have put themselves to the trouble of inspecting the old MSS. 900 Years old; for the Great Letters are done by the Illuminators the same way

as Card-making ; as I shall treat of more at large in another Differtation.

The next Form of Printing at *Harlem*, was by cutting whole Forms in Wood from MSS. exactly written, and without Pictures : Such I take the *Donatus* to be, mentioned in Histories ; and this might bear Date in 1450, some say 1440. This may be as plainly demonstrated, as the former, from Copy-Books which we have seen Printed at *Rome, Venice, Switzerland* and *England*, as high as 1500 ; and, if I mistake not, there is a Block cut in Box in the Collection of your *Museum* in *Gresham-College*. This writing is harder to perform than either the *Roman, Italick*, or any other Letters used in Printed Books.

The third way of Printing was with single Types made of Wood, but to whom the Honour of the Invention is due, is not very evident ; it was then esteemed so great a Rarity that the Printers carry'd their Letters in Bags at their Backs, and got Money at Great Mens Houses by Printing the Names of the Family, Epitaphs, Songs, and other small Pamphlets.

The fourth Improvement of this Noble Art was the Invention of single Types made of Metal. Here we must intirely give the Honour to the never to be forgotten *Peter Scheffer* of *Grenschen*, Servant and afterwards Son-in-Law to *Fauß*, who entertain'd him to Work in his House at *Mentz* : He observing how industrious his Master was every Day to improve this Art, undertook it himself ; and with much Study and Industry, brought it to Perfection. After he had made several Essays, at last he shews it to his Master *Fauß*, who having tried some Experiments with his new invented single Types, finding that it would answer his Expectation, was so transported with Joy, that for his Reward, he promis'd he should Marry his Daughter, a very Beautiful Damsel, whose Name was *Christian*, which sometime after he performed, and continu'd toge-

ther improving this Art with great Secrecy, till it became known, and spread it self over all *Europe*. Sometimes you have their Names to the Books they Printed at the end, and sometimes not; sometimes with Dates as high as the Year 1457. as the Psalms Printed by them, now in the Emperor's Library, which *Lambecius* mentions in his *Bibliotheca*, and as low as the Year 1490; and for this we have the Authority of *Erasmus*, in a Preface to *Livy*, Printed at *Basel* by *Froben*, in 15 . .

As for *John Gutterburgh*, tho' by abundance of Authors he is said to be the first Inventor of Printing, we cannot find one Book with his Name and Printing; but this requires a longer Consideration, which in its due place I shall take notice of.

We may rationally conjecture, that Printing with Plates of Pewter, Brass, or Iron, either Graved or Eat with *Aqua fortis*, was first practis'd by the Working Goldsmiths; for they have a way of taking off the Impressions of their Work, by the Smoak of a Lamp, which, perhaps, gave the Hint to the Graving on Brass. We have a dark Story of it in some Authors, but I shall enlarge upon this Subject.

Having treated of Printing to satisfy the Curious, I shall say something of the several Advances and Improvements it hath received.

The *Harlem* Printing at first was a Book with Pictures; they took off the Impression with a Lift coiled up, as the Card-makers use the same to this day.

But when they came to use single Types, they made use of stronger Paper, with Vellum and Parchment: Then they made use of a Press, altho' they afterwards contrived and made it more useful, as I shall treat of in another place.

Neither was their Ink for Printing brought to Perfection at the first, but improved by degrees.

Rowling-press Printing was not used in *England* till King *James the First*, and then brought from *Antwerp* by our Industrious *John Speed*.

I shall also discourse at large of the Invention of making Paper in *Europe* from all the best Authors, with large Observations of my own ; the time when it began in several Places, more especially in *England* ; and I intend to exhibit a Specimen of the Marks of the old Paper, which has not yet been attempted by any.

Bookbinding shall be handled in all its Parts, its several Ages and Times : Also the Form, Size and Volume, Folding, Sewing, Headbanding, several sorts of Boards for Covers, Clasping, Bosting, &c. Also in all Countries, as *China*, *Persia*, *Turkey*, *Greece*, Ancient and Modern *Germany*, *Italy*, *France*, *Holland* and *Spain* ; but more particularly *England*.

The Devices, *Rebus*'s, and Signs of the Ancient Printers will take up a whole Chapter, where their Descent and Genealogies shall be shewn, and how they succeeded one another in their Office, or Printing House. On this Subject I have no Path to follow ; but *Draudens* hath a Tract I find mentioned, that treats of the ancient Devices of the Printers, but after my Inquiry, I could never see it, and so can receive no assistance from it. Also *Naudens*'s Life of *Lewis the Eleventh* hath an Account of *Faust*'s Printing the Bible in the *Latin* Tongue, his bringing them to *Paris*, and vending them there for *MSS.* his Troubles and Accusations before the Parliament, being tried for a Conjuror, which I conceive gave occasion for that foolish Book, that goes under the Name of *Dr Faust*'s Life. This is not my own thought, but the Sentiments of others, for we have another Example of the like nature for our famous *Roger Bacon*, tho' some Centuries of Years before, who had the like Fate.

Since my second Voyage to *Holland*, to satisfy my Curiosity and remove some Scruples about the Book at *Harlem*, and the Statue of *Coster*, having recollected my self after my first Voyage, and discoursing with Mr. *Talman* Junr. about *Holland* and the Statue of *Coster* ; he told me he had
seen

teen the same in *Holland*, and that it was in the *Harlemer-street* in *Leyden*. This very much run in my mind, to be further satisfied that it should be in *Leyden* and not *Harlem*, altho' asserted by several of our Modern Travelers.

At my last being in *Holland*, for my further satisfaction, tho' I had got Mr. *Ball* to take the Inscription for me the Year before, in *June* 1705, having an opportunity in the Company of my good Friend *Walter Clavel* Esq; on *Wednesday* the 23^d of *October* 1706. we took Boat for *Leyden*, where we arrived about six the same Day, and next Day in the Morning, in the Company of Mr. *Bovell*, a Student there, who was our Guide into the *Harlemer-street*, so called because it leadeth to the *Harlem* Parts, over the Door of a Glazier's House was the Figure of *Coster* cut in Wood, and painted with the Inscription.

This Statue was not set up by any Publick Authority of the Magistrates of that City, but by a Private Man; and, if I mistake not, by the Owner of the House, perhaps for the name and sake of the Street; and, as I suppose, not older than about 1630. This Statue is done after the Graved Print that is in the Book at *Harlem*, or the Painting over the Door of *Laurence Johnson Coster*, where they say he first practis'd the *Art of Printing*, but I rather take it, that he liv'd in this House in his Old Age, and was Church-Keeper, or as we call it, *Sexton*; for so the Word signifies both in the *German* and *Dutch* Language. This afforded me some satisfaction.

Some Days after leaving *Leyden*, in Company of my Friends, Mr. *John Bullord*, and Mr. *John Murray*, we set forth from *Amsterdam* in a Waggon for *Harlem*, to compare and collate the Book which Mr. *Bullord* had procured for me with that at *Harlem*, it being another Impression in *Quarto*. The Name of the Book at the latter end runs thus :

This

This Book was finished in the good City of Culenburgh, by me John Veldener, in the Year of our Lord 1483, on the Saturday after St. Matthew's Day; with the Device of the Printer hanging on the Bough or Snag of a Tree, a Custom they much used in those Days, as may be seen by the Monuments of the Ancients cut on Grave Stones, not only in the Great Church at Harlem, but several other Cities in Holland : Which Device I will insert.

The Title of the Book in *Low Dutch*, the Language in which it is Printed, is,

De Spiegel onser Behondenise.

In *English*,

The Mirror of our Salvation.

When we arrived at *Harlem*, much to my surprize, we found the House of *Coster* new faced with Plaster, and the Picture of his Statue, (for it is no other than a Picture in Oyl-Colours) painted on a Board let into the Wall near the Top of the House, although it be a small one. This House was new repaired and to be let, altho' when I was there before, it was inhabited by a Cheesemonger. After viewing the House and the Great Church, we directed our way to the Rector, who is the School-master, put in by the Magistrates of the City. He not being in the way, his Servant Maid took the Key, and readily gave us admission into the Princes Garden, in order to shew us the Book, which was remov'd from the Stair-head of the Prince's *Houffe*, or House, where we saw it last, to the further end of the Garden, in a little House fitted up for that purpose, facing the Garden. On the Chest that it was kept

kept in there was the Date 1618, inlaid in the Wood. Opening it the Maid shewed us the Book, where Mr. *Eullord* collated it with the other we brought with us from *Amsterdam*, and found it to agree both in the words of the Text, and also the Pictures; they only differed in this, that being in Folio, with two Pictures in a Page, and the Words Column-wise, and 25 Lines in a Column, containing 60 Pages, and Printed but on one side, and not pasted together as those at *Oxford* and *Cambridge*.

This will enable me to oblige the Curious with a Specimen of the *Harlem* Book, as well as those of *Oxford* and *Cambridge*, the latter I have cut for my History of Printing, as I do intend the others.

After I had gratified the Maid for her trouble, we addressed our selves to an old Gardener that was at work in the Garden; for Mr. *Bullord* had enquired of him when we came first into the Garden, whether he knew any thing of the Statue of *Coster*, and he readily told him, he could shew him it. At the Entrance into the Garden, at the upper end of the Summer-house, on the Right Hand, he pointed to it, where we saw it leaning with its Left Hand on the Inscription, which bore Date 1440; and in its Right Hand the Letter A in a Square, with other Figures, as little Boys naked, and in their Hands A B C, with the Picture of *Fame* holding the Letters C D and E. This was taken from the Story of *Junius* in his *History of the Low Countries*, and others from him. There are other Stories painted on the Walls of the Summer-House, as one of the Lords of *Harlem* in his Armour; but they not being to my purpose, I shall pass them by.

All these Pictures, with the Statue of *Coster*, are painted in Distemper, and are no older (as appears by the Date on the Ceiling) than 1655.

This is a short Account of my second Voyage into *Holland*, and the Advantages I have gain'd by it, in collating the so much esteem'd Book by the *Hollanders*, which
seems

seems to me not so rare as at first, since I have had a sight of that at *Benet College* in *Cambridge*, and those at *Oxford*; which will also enable me to give a further Account than hitherto hath been done, by the help of some Books that have been procured me by my Friends Interest, as that of *Naudæus* his Story of Printing in the Life of *Lewis XI.* in Mr. *Bayle's* Collection, procured me by Mr. *Leers* of *Amsterdam*, who got the Favour for my Friend Mr. *Bullord*, to Translate that part which relates to the History of Printing, the Story of *Faust*, &c. and the first Printing at *Paris*, as well as at *Mentz*; this contains 16 Sheets in MS. with other Critical Discourse, relating to Learning and Books that were first printed. These I have been in search for many Years, and am apt to believe there is never an one in *England*.

One Book more I want to see, and should be extremely satisfy'd, if any one could procure me the sight of it. It is a small Tract wrote by *Draudius* in small *Twelves*. *The Devices of the Printers*.

I have had the Chronicle of *Collen*, which *Naudæus* could never see, and also a Book printed at *Leipswick* in the *German* Language, giving an Account of the *Jubilee* kept there in Memory of *Printing* and its Invention, Translated into *English* by my Friend and Correspondent Mr. *Bullord*; with many other Tracts relating to the first Invention of *Printing*.

I have spared for no Cost or Pains in procuring of Copies of Books, where they are to be had, for the illustrating it in all its parts to satisfy the Curious. Now as *Printing* it self is but another way of Writing, and brought to perfection by degrees, as other Arts; and as Pictures either painted, cut in Wood, or Graved, were called the Laymens Books; for every one could read a Picture, and say this is an House, and that a Tree; so I may say, that the Pictures, or Drawings of the Ancients,

gave the first hint of *Printing* ; and if the Scribes in process of time had not brought their *Art of Writing* into the Decorum and Uniformity, and Rule in their several Volumes, the *Printers* could not have followed them so exactly in the imitation of their Letters and Pages of their Books. Pictures first were those of Devotion ; then the making of Cards was another introduction to the Invention of *Printing* : The making of Cards I take to be very ancient.

For the first Specimen of *Printing*, was on one side only, as that at *Bennet College*, most in Figures, with some few words only on the side in Labels like that at *Oxford*.

The next Step is that Book at *Harlem* ; the Designs of the Prints are better perform'd, and then they came to have not only Lines, but whole Pages of Words, besides the Pictures on a Page.

The next Step was *Ballad-Printing* with the like Pictures, and them but on one side.

The next Improvement of this Noble Art, was the cutting of whole Pages on Wooden Blocks or Moulds, and Printing on both sides of the Page ; and the first Specimen of this Nature was a *Donatus*, and, as Authors say, was Printed at *Harlem* and at *Mentz*, altho some say a Bible was Printed the same way 1457.

For the History of making Paper here in *Europe*, I have, by the assistance of my Friends in the Tower and elsewhere, been enabled to give a large account of its Antiquity, almost two Centuries higher than I thought of, and shall give the Marks of the Ancient Paper from the 12th Century down to 1600, in the several Countries where the *Paper-makers* lived.

This, I am apt to think, was never attempted by any Author before. The Specimens of Ancient Pieces of MSS. and also of Ancient Paper, collected by my self some Years since,

since, and bound up in 2 Volumes in large Folio, are now to be seen in the Library of his Grace the Archbishop of *Canterbury*, in *St Martin's*, collected and put together at no small cost and pains ; perhaps the first of that kind that ever was done in any part of *Europe*.

I conclude with informing you, that in this Treatise I shall give an Historical Account of the several Versions and Impressions of the *Holy Bible*, *Testament*, *Psalms*, *Primer*, and other Books of Devotion, from the beginning of the *Reformation* down to 1600. At first I had no thought to have inserted them, but some Collections coming into my Hands of late, wherein I find several material Passages not mentioned by any that have gone before me, so amply and fully, as I shall for the Information, and at the Request of my particular Friends, treat of them in a distinct Chapter.

An Account of Mr. Bagford's Collections for his History of Printing, by Mr. Humfrey Wanley, F. R. S.

HIS Collection consists chiefly of *Title-Pages* and other *Fragments* put together into Books, many of them in some sort of Order and Method, and others not. *Ex. gr.*

In one Volume there are Specimens of *Letters* of all sorts, as well of those used in Foreign Countries, as in *England*.

In another are Titles and Fragments of *Almanacks* from *A. D.* 1537. downwards ; with Titles of *Bibles*, *Law-Books*, &c. Printed by the *Company of Stationers* in *London*.

In other Volumes are the Titles of Books of all Kinds, printed by the *London-Printers*, disposed into some sort of Order, viz. as to the Subject of the Book, or Dwelling-place of the *Printer*.

In others are Title-pages of Books printed in *Oxford* and *Cambridge*.

In others, Title-pages of those printed in *Scotland* and *Ireland*.

Title-pages and Frontispieces, with other Specimens of the Works of our *English Engravers*.

Titles of Books printed by *Roman Catholics*, *Presbyterians*, *Quakers*, by other *Seſtaries*, by *Seditious Persons*, &c.

Cuts of *Monuments*, *Tombs*, *Funerals*, &c. in *England*.

Cuts of the same in *Foreign Parts*, with the Cuts of the manner of *Executing Criminals*.

Cuts with some Drawings of Habits of divers Nations, of several Trades, of *Utenſils*, *Weapons*, *Fountains*, or *Wells*, with other Prints useful in *Joyners* and *Masons* Work.

Cuts of Figures in different Postures, as *Writing*, *Reading* and *Meditating* ; with all the *Utenſils* used in *Writing*, &c. during some Ages. Cuts of *Schools*. The *Heads* of some *Arithmeticians* ; *Alphabets* ; Specimens of *Knot work*, and some *Great Text* and other Letters. Specimens of *Letter-Graving*. *Heads* of *Writing Masters*, *Dutch*, *French*, *English*. Specimens of Letters Engraven in *Small* ; as also of *Short Hand*, &c. *Heads* of *Short Hand Writers*, and Specimens of their Works, and many other things.

Title-pages of *Books*, and *Printers Devices* ; Printing in the *Spanish Netherlands*, *Spain* and *Portugal* ; Titles of Books published by *English Catholics*, *Alphabets* of *Plantin's Capital Letters*, &c.

Title-Pages, Alphabets, and Printers Devices, used in Basl, Zurich, and in other Places in Switzerland.

The like for the *United Netherlands.*

The like for *France.*

The like for *Germany*, with some others of *Poland, Switzerland, Denmark, Bohemia, and France.*

The like for *Italy*, with some others of *Geneva, Sicily, &c.*

Collection of *Acts of Parliament, Ordinances, Proclamations, &c. Regulating the Press*; with many other *Papers.*

Proposals for Printing particular Books.

Catalogues of Books, relating to *Painting, Printing, &c.*
Specimens of Paper differently Coloured. *Marks* on the
Outsides of Reams of Paper; with *Orders, Cases, Reasons, &c.* relating to the *Manufacture.*

Old *Prints or Cuts* from *A. D. 1467.* with the *Effigies and Devices* of many *Printers, Foreigners and English*; with other *Cuts and Specimens of Paper, &c.*

Collection of *Epitaphs* of the *Printers in Basl*; with the *Life of John Froben*; Catalogues of *Books, &c.*

Collections relating to the *Lives of the Engravers* of divers Countries.

Titles of Books Printed in most Parts of Europe, before the Year 1500.

Collection of *Patents for Printing Law-Books, &c.*

Some *German Cards.*

With many other *Volumes of Collections of the Kinds* abovementioned, tho' not so well sorted.

And these *Title Pages of Books* are really useful, upon many Accounts, *viz.* as being Authentick and exact, when as in most *Catalogues*, the *Titles* are abbreviated and otherwise imperfect. Besides, these *Titles* informed me of many Books I had never heard of before; and from them I have been enabled to enquire for several Books, some of
which

which I have since procured to my great satisfaction. And it is my Opinion, that there are but few Curious Men, but upon the View of this Collection, will own they have here met with several *Titles*, or other *Fragments of Books*, in their several ways, which they knew not of before. And thus we see, that a single Leaf of Paper, tho' not valuable in its self; yet when come to be part of a Collection, may be of good use, not only in respect of the *Matter it Treats of*, but as to the *Mark of the Paper, the Date, Printer's Name, Countrey, Title, Faculty, &c.*

Mr. *Bagford* has also a very plentiful Collection of the *Titles of Books Remarkable and Curious*, which he has taken from the Books themselves. And when they are of such sorts, as now are seldom to be seen Entire, he has made such Observations, as that the several Editions shall be certainly known, tho' your Book be Imperfect at Beginning and End.

Mr. *Bagford* also says, that tho' his Collection is not put into exact Order, his Book, or *History of Printing*, shall be drawn up with that Regularity, as shall answer any Gentleman's Desire and Expectation.

III. *An Account of a Pyramidal Appearance in the Heavens, observed near Upminster in Essex, by the Reverend Mr. William Derham, F. R. S.*

Upminster, April 7. 1707.

THE Afternoon of *Thursday April 3.* last, I devoted in some measure to the service of the *Royal Society*, to take Angles, in order to finish my Observations about Sounds. And as I was returning home, I perceived in the Western part of the Heavens, about a quarter of an Hour after Sun-set, a long slender *Pyramidal Appearance*, perpendicular to the Horizon. The *Base* of this *Pyramid* I judged to be doubtless the Sun (then below the Horizon.) Its *Apex* reacht 15 or 20 Degrees above the Horizon. It was throughout of a rusty red Colour; and when I first saw it, pretty vivid and strong; but the top-part fainter much than the bottom, nearer the Horizon. At what time this Appearance began, whether at, or how soon after Sun set, I cannot say, being at that time in a Friend's House. But about a quarter of an Hour after Sun-set, as soon as I was gotten abroad, I perceived it, and had for some time a fair Prospect of it, the Horizon being pretty free and open where I then was. But after a while, it grew by degrees weaker and weaker, so that in about a quarter of an Hour after I first saw it, the top-part (*a. b. d.* in *Fig. 1.*) was scarce visible. But the lower part remain'd vivid much longer, but yet grew by degrees shorter and shorter. I saw the Remains of the lower half (*b. d. e. f.*) a full Hour after Sun-set; and should perhaps have seen it longer, had the Horizon been open. But it was often in my Walk pent up with Trees, which not only

only obstructed my sight of the end of this unusual Appearance, but also hindered me from an exquisite Observation of all the Particulars that might probably occur.

The whole Atmosphere seemed hazy, and full of Vapours, especially towards the Sun-set. The Moon and Stars were that Evening bearded at that time, and succeeded with an *Halo* about the Moon afterwards. Which disposition of the Air was probably the cause of the Phenomenon. But the Pyramid was undoubtedly imprinted upon the far distant Vapours of the Atmosphere; it being manifestly farther off, or lying beyond some small thin Clouds (*c. l. c. l.*) that intercepted it, and in those parts covered and hid it.

Altho' I have the greatest part of my Life been ready enough to take notice of such Appearances, yet I do not remember I ever saw any thing like it, except the white Pyramidal Glade, which is now entituled by the Name of the *Aurora Borealis*. And it being (except in Colour and Length) so like that, I have thought it worth your cognizance, and, if you think fit, of our most illustrious and famous Society also; because it may perchance in some measure conduce to the Solution of that odd Phenomenon, the *Aurora Borealis*.

I was just going to give you some of my Observations about the Migration of Birds this Year, which makes me hope, that that Subject is within the reach of the *Royal Society* to discover. But being prevented, I have not time just now, but shall reserve it for a more convenient Opportunity, when I have more leisure.

I have searched every Night since for this *Pyramis Vespertina*, but have not seen any such Appearance, although the next Evening was hazy and likely. I also looked out to see whether the *Aurora Borealis* would succeed in the room thereof, but discovered no such thing.

IV. *An Account of an Experiment, confirming one lately made, touching the Production of Light, by the Effluvia of one Glass falling on another in Motion.*
By Mr. Fr. Hauksbee, F. R. S.

HAVING observ'd that the *Effluvia* of Glasses were capable of Exhibiting a *Phænomenon* falling on an Exhausted Glass in Motion, as if rub'd by a visible Solid Body, (as I lately shew'd before this *Honourable Society*;) I thought a farther Confirmation of the same, would not be unacceptable. In order thereunto, I devis'd the following Experiment.

I took a large Receiver in form of *Fig. 2. a. a. a. a.* Within the Body of which, I fixt another in manner and likeness of *b. b. b. b.* their *Axis* lying parallel to the Horizon, and were fixt one within another at *c. c.* The outward surface of the inward Glass was at least an Inch distant from the inward surface of the outward one; and were turn'd by two large Wheels, whose Bands related to the small Wheels *d. d. d. d.* fix'd on their *Axis*. The inward Glass was first Exhausted of its Air; then being fixt, as before describ'd, I order'd that Wheel only to be mov'd, which gave Motion to the great Glass; thinking that when the *Effluvia* of that Glass, by the Application of my Hand upon it, should reach the other, notwithstanding it was at rest, it would nevertheless be affected by it and give a Light; which accordingly fell out as I expected, spreading its self in flying Branches all over. Then causing the other Wheel to be turn'd, the

Light became more considerable ; and, I think, the greatest as yet that has been produc'd in any Experiment made on this Subject ; and doubt not, but would have been more so, had the inward Glass fitted nearly to touch the inward Surface of the outward one ; the *Effluvia* of which, (as it seems to me) would then be capable to act with more Vigour on the Exhausted moving Receiver. But to return : I caus'd both the great Wheels to give Motion to the Glasses one and the same way, with as equal a Velocity as they could ; yet I did not discover but the Light was then as strong, and continuing, as when their Motions were made Reverse : So that I do not perceive that a Disenting Motion from each other does any way contribute to the *Phænomenon* ; but Motion it self, without being prescrib'd by Rules, (as this Experiment seems to insinuate) is found absolutely necessary, as indeed the whole Course of Experiments on this Head abundantly confirm. I farther observe, that notwithstanding the *Effluvia* seem'd to be equally distributed on the outward Surface of the inward moving Glass, yet the Light was most vigorously apparent on that side of it nearest the Attrition : And when the Motion of the outward Glass was ceas'd, or the inward one, and the other in Motion, (for upon trial I found very little Difference either way,) the Light would continue to appear a considerable time within the Exhausted Glass, till the *Effluvia* of the other, were no longer capable to act with so much strength, as to lay hold or affect the inward one. I likewise observ'd, that after both Glasses had been in motion for some time, and the Hand apply'd all the while on the outward one, that then the Motions ceasing, and no Light appearing ; was but approaching my Hand near the Surface of the outward Glass to produce Flashes of Light like Lightning. In the inward one, the *Effluvia* seeming then to be no vigorously pusht upon it by the approaching Hand. No

how these *Effluvia* of Glafs become capable to Act or Perform the Office of a Solid Body, or why such a *Medium* is requir'd in the inward Glafs to produce the Light, I think are worthy the Consideration of this Society. For I have try'd, that upon letting in a little Air, the Appearance of it dy'd, nor could it then be recover'd in that state altho' diligently endeavour'd.

V: An Account of an Experiment made before the Royal Society at Gresham College, May 28. 1707. Touching the Difficulty of Separating two Hemispheres, upon the injecting of an Atmosphere of Air on their outward Surfaces, without withdrawing the included Air. By Mr. Fr. Hauksbee, F. R. S.

Since the greatest Satisfaction and Demonstration that can be given for the Credit of any Hypothesis, is, That the Experiments made to prove the same, agree with it in all Respects, without force: As in that of Sound, the Air is prov'd the proper Vehicle to communicate it, not only by its lessening according to the degrees of Rarification; but by its increasing according to the Degrees of Condensation. Now altho the Pressure of the Air is evident by a number of Undeniable Experiments made by the Air Pump; Yet the several Phænomena of which, being liable to be accounted for by the *Suctionists*, and *Funicularians*, to proceed from some (unintelligible) Internal Cause; therefore to put the Matter of Fact (I think) past all Dispute; I devis'd the following Experiment.

I took a strong Glass Receiver, open and arm'd with Brass Hoops at top and Bottom: To which parts were apply'd two Brass Plates with wet Leathers between them, but first were included two Brass Hemispheres which I join'd on a wet Leather, their Diameter was 3 Inches and half. A Mercurial Gage was likewise included. To the upper Hemisphere was screw'd a large Brass Wire, which pass'd thro' a Box of Leathers that was screw'd on the Upper Plate, and could easily be mov'd up and down without suffering any Air to pass with it. To the upper part of this Slip Wire was screw'd a Cock, thro' which the Air was to be Injected. In this manner the lower and upper Plate were screw'd strongly to the Receiver; into which, after an Atmosphere of Air had been thrown, (which was easily discoverable by the Gage, the Air in which possessing but half the space it did before,) the Syringe was taken off, and an Iron with an Eye was screw'd on in its Place, by which the whole *Apparatus* was suspended on a Triangle. To this Iron related the Slip-Wire and Upper Hemisphere; All the rest being part of the weight made use of to separate them. Then into the Scale, which hung at its bottom, was put in so much Weight as, with its Aggregate, amounted to full 140 Pound, before the Hemispheres could be parted: The Friction of the Slip-Wire thro' the Box of Leathers was very inconsiderable. Now how those Gentlemen, who account for the Ottoegerick Experiment by Suction, or the Funicular Power, how, I say, will their Hypothesis Answer for this, which is only the Reverse of it, (there being no room left to apply either, the Air within the Hemispheres remaining in its natural State) I cannot tell; but think they must abandon their Reason to deny the Doctrine of the Airs Pressure, after so convincing an experiment as this, which not only most strongly confirms and establishes the same, but leaves no manner of Room for any other Hypothesis to take place in it.

P O S T S C R I P T.

I have since repeated the same Experiment with the like Success as before. And to try how agreeable it would answer all manner of ways, I caused the same two Hemispheres to be exhausted of their Air, and then found that the like weight was requir'd for their Separation, as when the additional Atmosphere of Air was thrown on their outward Surfaces without withdrawing the included. And farther to confirm the same, I not only caus'd the inward Air to be withdrawn from the Hemispheres, but then being included within the Receiver, I likewise caus'd the same Quantity of Air to be injected on their outward Surfaces, as in the former *Experiment*, and then found that 280 l. (which was double the weight before requir'd) did not separate them. I was unwilling to add more (tho' I knew a small Addition must have done it) fearing the breaking some of the weaker parts, which I thought were in danger by the fall of such a Weight: The Experiment being apparent and satisfactory without it.

VI. *Some Natural Observations made in the Parishes of Kinardsey and Donington in Shropshire, by the Reverend Mr. George Plaxton. Communicated by Mr. Ralph Thoresby, to Dr. Hans Sloane, R. S. Secr.*

S I R,

YOU have oftentimes desired me to give you an Account of such Observations as I had made in my Parishes in *Shropshire*, and in some of the neighbouring Villages ; my poor Remarks are hardly worth your notice, however to shew you that I cannot deny you any thing, I now send them, or some part of them.

Anno 1673, I was presented to the Vicarage of *Sheriffes-Hales*, and also to the Rectory of *Kinnardsey*, the former in the Counties of *Salop* and *Staff*. The other wholly in *Shropshire*. *November 6*. I was inducted into the Parsonage of *Kinnardsey*, where I was incumbent for 30 Years and upwards ; at my Induction I found a great many *Aged People* in the Parish, upon which I took the Number of the Inhabitants, and found that *every sixth Soul was Sixty Years of Age*, and upwards, some were 85 and some 90 ; this I could not but wonder at, considering that the Town was furrounded with a large Morass, overflowed in Winter, and that you could not come into the Parish any way upon Arable Land. At my Entrance there, I found neither *Gentleman* nor *Begger*, nor any sort of *Dis-senter* from the Church ; there had been no *Law Suit* amongst them in the Memory of Man, nor was any commenced

menced during my Incumbency as Rector there, for above Thirty Years together ; they have but *one way to the Town and Parish*, the rest they hire from Lords of the adjacent Manours. The *Morasses* or *Moors* are of a great extent, and the Parish was surrounded with them, the Village was called *Kinnardsey* or *Kinnardus his Island* ; *ei, ea, ey*, all these are Watry Terminations : Thus the next Parish was *Eyton*, the Town upon the Waters, *Edney*, or *Edwyney*, *Edwin's Island*, *Buttery*, or *Butterey*, the Island of Butter, being a long Grazing Tract of Land, with some others of the like ending. All that vast Morass was called, the *Weald-Moor*, or the Wild Moor, that is, the Woody Moor : Thus the *Wood-Lands* of *Kent* are called the *Weald* of *Kent* ; the *Wolds* of *Yorkshire* most probably have been Woody formerly, and called the *Wealds*, for the Word *Weald* or *Wold* is by our *Saxon* Masters render'd *Woody* ; and I have been assured from Aged people, that all the Wild Moors were formerly so far overgrown by Rubbish Wood, such as Alders, Willoughs, Salleys, Thorns, and the like, that the Inhabitants commonly hang'd Bells about the Necks of their Cows, that they might the more easily find them. These Moors seem to be nothing else but a Composition of such Sludge and Refuse as the Floods left upon the Surface of the Ground, when they drain'd away, and yet this Sediment is full three or four Foot thick ; for I have often observed, that the Black Soil cast up by Moles, or digged out of the Ditches, was a meer Composition of Roots, Leaves, Fibres, Spray of Wood, such as the Water had brought and left behind it ; in Digging they often find Roots and Stumps of Oaks three or four Foot under the Surface, and they are very common in the bottom of their Ditches and Drains : The Soil is peaty, and cut up for Fuel in some part of the Lordship ; in the bottom of these Peat Pits, they find Clay, Sand, and other sorts of Earth. These Grounds have

have been formerly much higher, for I have observed Oaks and other Trees, where the present Soyl is so much shrunk and settled from them, that they stand upon high Stilts, and are supported from the great Fibres of the Roots, so that Sheep may easily creep under them.

That great Tract, called formerly *Vasta Regalis*, is now by Draining become good Pasturage, and yields my Lord Gower, the Owner of it, a considerable Rent, his Ancestors having purchased the Royalty from one of the Earls of *Shrewsbury*: It yields great Quantities of Hay, tho much of it is of such a nature, that it will dry up a new Milch-Cow, starve an Horse, yet will it feed an Oxe to admiration; and I have heard some Grasers say, they could not by their best Upland Hay feed an Oxe so fat, as the Moor-Hay would do; this, I suppose proceeded from its dry and binding Quality that made the Oxen drink much.

One thing I must further observe to you, within the Parish, about half a Mile from the Church, there is a pretty Farm call'd *The Wall*, which I judge was formerly a *British Fortification*; 'tis encompassed with a Morass, and raised up from Sand, broken Stones, Gravel, and Rubbish to a great height and breadth, being (as I measured it) above 1900 Yards in Compass, and 16, 18, and 20 Yards in Breath: In some places it seems to have been Built before the Moors became Boggy, for I could never find any way over the Moors, by which they could carry those vast Quantities of Earth, Clay, Sand and Rubbish to raise that mighty Rampire. In that Parish I was the *Sixth Rector* from the Days of *Henry VIII*.

As to my Rectory of *Donington*, to which I was presented *Anno 1690*. I found there as many *Old People* as I did at *Kinnardsey*, nay, I may say more; and in the two Parishes I had but a difference of three in the Number of the People; at *Kinnardsey* I had 135 Souls, at *Donington*

138 ; of the 135 I had 23 Aged 60 and upwards, of the 138, 24 ; both which Numbers Multiplied by 6, the one at *Kinnardsey* was 138, the other at *Donington* would have been 144. I had nothing very remarkable at *Donington*, save the *Royal Oak*, which stood at *Boscobell* within the Parish, and the Owners thereof paid 6 s. 6 d. yearly, in lieu of their Tythes and Offerings : The *Royal Oak* was a fair spread thriving Tree, the Boughs of it were all lined and covered with Ivy ; here in the Thick of these Boughs the King sate in the Day-time with Colonel *Carlos*, and in the Night lodged in *Boscobel-House*, so that they are strangely mistaken, who judged it an old hollow Oak, whereas it was a gay and flourishing Tree, surrounded with a great many more ; and as I remember in Mr. *Evelyn's* History of Medals, you have one of King *James I.* or King *Charles I.* where there is a fine spread Oak with this Epigraph, *Seris Nepotibus Umbra* ; which I leave to your Thoughts.

The People here live to *great Ages* ; I saw in one House three Healthful People, whose Ages numbred together made 278, and I think they lived some Years after ; they were the Man and his Wife, and his Wife's Brother.

I was at *Donington* about 13 Years and some Months ; in all that time I Buried but 27 People, of which Number 4 came from Neighbouring Parishes, 4 were Young ones, and of the remaining 19 the youngest was about 60, and the eldest 96 Years of Age. I was there the fourth Legal Incumbent in Succession from the *Reformation* ; and as I remember at one Triennial Visitation of the Bishop, we had neither Burial or Wedding to return into the Registry at *Litchfield* : The Country is very Healthful in those Parts, and tho it seems to the Eye of a Traveller to be but of a moderate height, yet in riding between *Donington* and *Wolver-Hampton*, which is but five Miles, you cross four Rills or Brooks in the Compass of three

Miles, two of which run into the South-West Seas, *viz.* to *Severn* and *Bristol*, the other two hasten to *Trent* and *Humber*, and so into the Northern Ocean.

The Poor Remains of the *Royal Oak* are now fenced in by an handsome Brick-Wall, at the Charge of *Bazil Fitz-Herbert* Esquire, with this Inscription over the Gate, (upon a Blue Stone) in Golden Letters.

*Fœlicissimam Arborem quam in Asylum
Potentissimi Regis Caroli Secundi Deus Opt. Max.
per quem Reges regnant, hic crescere
voluit, tam in perpetuam rei tantæ
Memoriam, quam in Specimen Firmæ
in Reges fidei, Muro cinctam
Posteris Commendant, Bazillius
& Jana Fitz Herbert.
Querus Amica Jcui.*

'Twas put up about Twenty or Thirty Years ago, but the Place deserved a Nobler Memorial ; I have writ it in such Lines as they have cut it, and as the Letters now stand ; a few Years will ruine both the Wall and the Inscription.

The Emblematick Medal my good Friend alludes to, is the XLVth in Mr. *Evelyn's Numismata*, which King *Charles I.* caused to be stamped in honour of the Installation of his Son, whereupon is the *Royal Oak* under a Prince's Coronet, overspreading Subnascent Trees and young Suckers.

SERIS. FACTURA. NEPOTIBUS. UMBRAM.

Reverse

Reverse within the Garter of the Order is this Legend.

CAROL. M. B. REGIS. FILIUS CAROL. PRINC.
INAUGURATUR. XXII. MAII, MDCXXXIIX.

The Inscription at *Boscobel* reminds me of one I had from the late Reverend Mr. *Illingsworth*, President of *Emanuel* College in *Cambridge*, which was Inscribed upon a Pillar erected by the Sea side.

*Siste, viator, iter, vestigia prima secundus
Posuit hic Carolus, quum redit exilio.*

VII. *An Account of the Cape of Good Hope, by
Mr. John Maxwell : Communicated by the Re-
verend Dr. John Harris, F. R. S.*

THE *Cape of Good Hope*, which is part of *Monomotapa*, and the Southernmost part of *Africa*, lies in the Latitude of 34 Degrees 30 Minutes South, and 16 Degrees 15 Minutes East of *London*. It was first, that we know of, discovered by *Bartholomew Diaz*, A. D. 1493, under *John II.* King of *Portugal*. He gave it the Name of the *Cape of Tempests*, because of the Storms he met with there, with which 'tis not strange that it is sometimes troubled; as likewise with a Sea that runs very high, and makes it ill riding at Anchor there, when the Wind is at North-West, seeing it is a Shread of Land stretch'd out into a vast Ocean on each side; but King *John* gave it the Name of *Bona Esperanca*, or of *Good Hope*, which at still remains; because

because that when that Cape was doubled, he had good hopes of finding out a way by Sea to the *East Indies*, about which he was then very solicitous.

The *Hottentots*, Natives of this Place, are a Race of Men distinct both from *Negroes* and *European Whites*, for their Hair is Woolly, Short and Frizled, their Noses flat, and their Lips thick, but their Skin is naturally as White as ours, as appear'd by a *Hottentot* Child brought up by the *Dutch* in their Fort here. Their Stature is universally of a middle Size ; they are clean limb'd, well proportion'd, and very nimble. I never saw a Fat Person among them.

They besmear their Faces and Bodies all over with Suet, or other Oleaginous Stuff, which, together with exposing their Bodies to a warm Sun, makes their Skin of a Tawny Colour, and causes them to stink so, that one may smell 'em at a considerable distance to the Windward ; they adorn their Hair, which is always clotted with Grease and nastiness like the Thrums of a Mop, with Shells, peices of Copper, &c. Both Sexes are clad with the Skin commonly of a Sheep, but sometimes of such Wild Beasts as they happen to kill, the Hairy side outward in Summer, and inward in Winter, off which I have seen 'em pick and eat the Lice in the Streets : The Women wear Skins cut in Thongs about their Legs, to the length of a great many Yards ; which when dry, with the inside out, look so like Sheeps Guts, that most Strangers mistake 'em for such. The Men hang their Privities in a Bag, and the Women cover theirs with a Flap or Apron made of Skin. The Women wear a Cap of Skin just dried and stitch'd together, whereas the Men commonly go bareheaded ; they go bare-footed, except that when they Travel they wear a piece of a Skin fasten'd about their Feet. Their Weapons are Javelins, with which they are very dextrous at hitting the Mark, and Bows with Poyson'd Arrows, which

which kill, as I am inform'd, upon drawing Blood, but what they are envenom'd with I could not learn: their Houses are Hemispherical, made of Mats, supported with Stakes, so low that a Tall Man cannot stand upright in one of them; These they remove upon occasion, as the Ancient *Nomades* did their Tents.

By all that I have seen and heard of them and other Nations, they are the most Lazy and Ignorant part of Mankind; by virtue of which two most excellent Qualifications, there are no manner of Arts practised among them, no Plowing or Sowing, no going to Sea in so much as a Boat, no use of Iron or Money, no Notion of God, Providence, or of a future State, no Tradition of Creation or a Flood, no Prayers or Sacrifices, no Magical Rites; nor, in fine, any Notion of any Invisible Being capable of doing them either good or harm, upon the strictest Enquiry that I could make of Men of Sense that had liv'd some time upon the Place; so that I believe their Ignorance hardly can be parallel'd: The only thing that looks like the least knowledge of any thing of this kind among 'em (in as much as I could learn) is a Custom they have in Moonshiny Nights of Dancing in the Fields, of which, if you ask 'em the reason, all their Answer is, that it is a Custom of the *Hottentots*, and was so of their Forefathers; and that is all they can tell you of the matter; now whether it be that they rejoyce in its Light, which dispels that darkness of which they are then most sensible, or whether they think it a Rational Being endued with freedom of Will, because of its various change of Forms, or for what other reason I will not pretend to determine; however as to no other thing, so neither to this do they Pray or Sacrifice: Nevertheless some Voyagers have upon this ground, how truly I will not say, confidently writ, that they worship'd the Moon; and upon Enquiry I could not find that they took so much, nor
indeed

judged any such notice of the Sun or Stars ; which former at least one would think a People so grossly ignorant would pay some respect to, if they worship'd any God, that being the most Glorious Object of their Senses ; and accordingly we find it affected all Heathen Nations, as well the more Barbarous as the most Polite ; in which single Object, if we may believe *Macrobius*, all their Worshipping center'd : Their great Ignorance, I suppose, may be in part caus'd by *Africa's* being Peopl'd (as is probable) by that end of it which joyns to *Asia* ; so that the more the Inhabitants spread themselves towards this Southern Extream, the more they were cut off from conversing with the more Civiliz'd part of the World ; it is probable, I think, that they were propagated to this Place by the Eastern Coast of *Africa*, the Western being now, and always having been, as far as we know, inhabited by *Negroes*, from whom it is not very probable, that these of so different a Colour should have sprung.

All the Resemblance they have of Government is, that in every Neighbourhood the Eldest is first in Order and Dignity ; his Advice as to what concerns the whole being most follow'd, as having most Experience. The Ceremony of Marriage is perform'd among them by the Eldest Person in the Company's sprinkling the Persons to be Married with his Urine, upon which, and cutting out one of the Man's Testicles, the Business is over ; this several that lived in the Place affirm'd to me for a certain truth. Being inquisitive to know the truth of this, I had the Curiosity to search several of 'em, (who will readily suffer you for a double Stiver to do it) in two of which I could find but one Testicle, they (I suppose) being Marray'd, as the rest who had two were not ; which however shews the mistake of *Nienhoff* and others, who assert, That the *Hottentots* cut out one of the Testicles of all their Male Children as soon as they are born (accord-

ing

ing to *Nienhoff*,) or at the Age of nine or ten Years (ac-
 cording to others,) and that, forsooth, to make 'em the
 more swift and nimble ; but how that fancy should
 come into their Heads, I cannot tell. When a Woman
 bears Twins among them, she exposes one to Death by
 by Hunger or Cold, and nurses the other ; the Reason
 of which two last Customs is alledg'd by some, how tru-
 ly I know not, to be the fear they have of their Nations
 growing too numerous : The Custom of revenging, rather
 than punishing Adultery with Death, has prevail'd among
 them. I was inform'd there, that they abhor'd *Polygamy* :
 tho' some Writers have asserted the contrary. but (per-
 haps) they are as well mistaken in that, as in the Semica-
 stration of all their Males. When any Person grows de-
 crepid with Age, their Children, or nearest Relations,
 shut 'em up in their Houses, and starve 'em to Death :
 They Bury their Dead with the Skins they wore when
 alive about them.

Their Food is for the most part Roots, but chiefly one
 by the *Dutch* call'd *Ontec*, which is roundish, about
 the bigness of ones little Finger, and hot in the Mouth ;
 their Drink is Milk and Water ; when they kill a Sheep,
 or a Cow, they Eat the Guts and Garbidge, either slight-
 ly broil'd or quite raw ; they are great Lovers of *Tobacco*
 and *Brandy*, to purchase which from the *Dutch*, is all the
 use they have of Money. They are not *Cannibals*.

There was a *Hottentot*, who had liv'd for some confi-
 derable time in *Holland* and the *East Indies*, and had
 learned to speak *Dutch* and *Portugueze* very well, whom,
 upon his return home, his Wife, Children, or Friends,
 could not endure, nor would they converse with him, till
 upon resuming his Ancient Habit, Diet, and Customs, he
 had returned to their way of Living.

Notwithstanding their great Ignorance, they distinguish
 several of the more remarkable Stars by Names of their

OWN

own imposing : Nevertheless they have no distinction of Weeks, of Months, or of Years, any otherwise than by their *Rainy Seasons* (of which afterward ;) for if you ask a *Hottentot* how Old he is, he answers, so many *Rains*. They watch the *Elephants* where they use to Water, whom they shoot in the Eye, where only they can wound 'em.

This Country produces Lyons, Tygers, Elephants, Rhinocerots, Elks, (whose Hoofs here are said not to have that Virtue ascrib'd to 'em in Northern Climates,) Leopards, Wild Asses, of which one sort is fin'ly streak'd with White and dark Brown ; several sorts of Beautiful Wild Goats, Jackals, Baboons, Monkeys, Deer, large Cows, and large Sheep without *Horns*, with *Hair* like a Goat, instead of *Wool*, and with *large Tails*, but not (in as much as I have seen) so large as some report 'em, viz. of 25 *l.* weight, (the *Flesh* however of both which is very good ;) small Horses, &c. Ostriches, Pellicans, Hawks, Magpies, Wild Peacocks, Cranes, Guiney Hens, Pengwins, Flemingo's, Rock-Ducks, Par ridges, Pheasants, Geese, common Hens, Turkeys, and Ducks, &c. Here are likewise Manatees or Sea Cows, they are low, very thick and ill shap'd, have very short Feet, and yet are very swift, have no Hair but what grows about their Nostrils, have large Teeth, but are no Enemy to Man ; they are not easily wounded, live much in Rivers, and are very shy. Here are Serpents of various kinds, with which however they are not much infested. Their Soil produces most sorts of Fruits and Plants that grow with us, as Grapes of several kinds, Apples, Quinces, Olives, Oranges, Apricots, Cherries, Aloes of a great many kinds, but none (that I saw) of the right sort, such as *Socotra* produces, Pompions in abundance, Cabbages, &c. Corn, as Wheat, Barley, &c. of *Dutch* Cultivation. Here are likewise Lizards, Salamanders and Porcupines. This place
is

is fit to produce whatsoever is planted in it, the Soil and Climate conspiring to its Advantage.

The *Dutch East-India Company* are said to have bought this Place of the Natives; but seeing they have no Government, to whom in that case could they apply themselves? Or of whom could they buy it? But if they did, they certainly had a good Bargain of it for a little Tobacco and Brandy: But the *Dutch*, who are no better than their Neighbours, are not so very scrupulous as to trouble themselves much about buying, in such cases, what they can take by force. Here however they have settled for the convenience of a Rendezvous for their homeward bound *East India Fleet*; and they have possessed themselves of the Country 60 Miles from the Place of their first Settlement: Beside their principal Town in *Table Valley* (so call'd from a neighbouring Hill, call'd *The Table Land*, because of it's Figure, from whence also the adjoining Bay is call'd *Table Bay*) where they have a Fort, an Hospital, a supplied Church with about 300 Families; they have two other small Towns in the Country, call'd *Drazenstein* and *Stallambuffs*, inhabited for the most part by *French Protestants*, who make most of the Wine the Place produces, which is not inconsiderable, either for Quantity, Quality or Variety, resembling *French Claret*, *Rhenish*, *Burgundy*, &c. they are about 120 Families, and have one Minister between both Villages, a *Dutchman* who speaks *French*.

In this place are reckon'd about 2000 Persons fit to bear Arms, and about 600 Soldiers; no Person that is not in their own Service, tho' a *Dutchman* is admitted into their Fort. They have prohibited the *English* to set up among them, tho' they have served the usual time of five Years in their Service, which Liberty they deny not to those of any other Nation; and this, I am inform'd, is their practise in all their *East India* Settlements: However when any *English Ship* happens to touch here disabled in

Masts, Rigging, Anchors, &c. they supply 'em for their Money out of their Stores.

Instead of Customs and Excise, they use Monopolies; for the Monopolies of Wine of the Growth of the Place this Year 1706, was paid 39000 Guilders, imported Brandy 3000, and so of the rest.

All the Publick Payments they make, are either for the Watch, or for killing of Lyons, 20 Dollars Reward being given for killing a Lyon, and 10 for a Tyger; the latter they Hunt, but the former they only dare attempt by Stratagem, whom they thus destroy: When a Lyon in the Night time gets among their Cattle, he commonly kills more than he eats at that time, whether he seldom fails to return the next Night to eat up the rest; but before he comes, they take care to set Snares about the Prey with Musquets so dispos'd, that in coming at it, he must of necessity draw the Trickers, the Muzzles being so planted, as that they seldom miss him; but if he be not kill'd out right, the poor Musquets are sure to feel his Fury, for he gnaws the Stocks, and imprints the marks of his Teeth in the very Iron; and tho' they are able to go away, there they are known to watch for two or three days to see who comes to look after the Execution, whom they set upon if they be not well aware.

A sort of Pilgrims in the *East Indies*, whom they call *Fouquiers*, and who often have occasion to Travel thro' Deserts, have a strange dexterity in killing these Wild Beasts; for when he sees one of them making towards him, he faces him, kneeling on one Knee, and holds towards him a short Spear in his Left Hand, upon which, the Beast making a Leap at him, pitches and fixes his Body, and then he runs down his Throat a Ponyard which he carries in his Walking-Staff, and so kills him. I had the following, concerning a Tyger, from an Eye Witness.

The

The *Colchester*, an *English East India* Man, was at that time in *Rogues River* in *Bengal*; it was Night when several of the Ships Company happen'd to be aboard in a Tent they had pitch'd to be merry in : Mr. *Raven*, first the Second-Mate had just put on a clean Shirt, he happen'd to be the farthest in the Company from the Door, with his Face opposite to it, when a Tyger rushed in among them, seiz'd him and carried him off in spite of them without having so much as a squeek for his Life : I suppose the glaring of the White Shirt, affecting the Tyger the most sensibly of the Objects that were before him, made him fix upon him rather than the rest ; the next day, upon search, they found some Remnants of his Body in an adjacent Wood. When a Tyger leaps at a Man, if his first Aim be avoided, he never, as they say, makes a second Attempt.

The Winds which blow at the *Cape of Good Hope*, are of that kind which are call'd *Monsoons*; for between the beginnings of *March* and *September*, (which is their Winter) the Wind blows for the most part between the North and the West, during which time they have not much fair Weather, from which Rainy Season the *Hottentots* compute their Year ; but during the other half Year, the Wind generally blows between the South and the East, accompanied with very fair Weather : There oftentimes comes down from the Neighbouring Hills most sudden and violent Gusts of Wind upon the Neighbouring Parts.

The Companies Garden, which is about 970 of my Paces long, and 230 broad, is not now in that fine order it was in during this Governour's Father's time, when it was divided into four parts, in each grew abundance of the more remarkable Vegetables belonging to its corresponding Quarter of the World ; but tho' the Climate, Soil and Situation are very favourable, 'tis now much

neglected both in respect of its Plants and Walks, neither of which are extraordinary.

I met here with one *Jennis Gerbrantzen*, Master of a Dutch Ship, who in the Year 1690, was at *Terra di Natal* on the Eastern Coast of *Africa*, in the Latitude of 30 Degrees South, distant from the *Cape of Good Hope* about 800 Miles, where he said he bought the Place for the Dutch East India Company, for 20000 Florins. Coasting thence to the *Cape of Good Hope*, his Ship was cast away, but they all got safe ashore, who to the number of 18, set out by Land for the *Cape* distant about 200 Miles, where only four of them arriv'd, all the rest dying by the way, through extremity of Hunger, Thirst or Heat, except two or three that were kill'd by the *Hottentots*; they met with no Wild Beasts by the way, Elephants excepted, whom they saw in great Numbers. In Year 1705. *Gerbrantzen* went again to *Terra di Natal*, the late King's Son then reigning, to whom he spoke of the former Agreement with his Father: *My Father*, answers he, *is dead, his Skins (i. e. Cloaths) are Buried with him in the Floor of his House, which is Burn'd over him, and the place is fenced in, over which none now must pass; and as to what he agreed to, it was for himself, I have nothing to say to it.* So *Gerbrantzen* urg'd it no farther, having no Orders concerning it from the Company. At his last being there, he met with an *English* Man who was left there *A. D.* 1698; he had two *Hottentot* Wives, and Children by 'em, but would not return with him to *Europe*, lest his Wives and Children should be slain in his Absence.

When I was at the *Cape of Good Hope*, I met with one *Mr. Kolbe*, who was sent thither by a *Prussian* Lord, the *Baron Krosick*, who likewise sent another to the Northward, each of 'em to take Observations, especially of Coelestial Phænomena, for the improving Astronomy, and Natural Philosophy; but Astronomy and Natural
Philosophy

Philosophy will not, I believe, be much improv'd by this Mission. This Gentleman told me, That the common Salt there made use of by the *Dutch*, was left in hollow Places of the Earth's Surface, after the Sun had evaporated the Rain Water; the matter of fact to me seems hardly credible: But if it be so, I think it can hardly proceed from any other Cause than the Rains dissolving a Salt contain'd in the Earth, which, upon the Rains being evaporated, remains in the Bottom; which is the more probable, because that within five Leagues of the Fort is the Salt Bay, which has its Name from the vast quantity of Salt digg'd near it.

The Variation of the Compass, or Magnetical Needle, in the Atlantick and Ethiopick Oceans, Anno Dom. 1706.

Variation.	Latitude.	Longit. from London.
8° 32' West.	49° 18' North.	07° 29' West.
6 42	44 31	13 45
5 30	41 06	15 08
5 04	40 22	14 54
4 22	39 11	15 35
3 30	32 21	15 39
3 35	32 42	15 38
1 20	18 50	20 52
1 14	09 26	17 59
1 10	00 49	18 42
1 00	01 09 South:	18 58
0 16	02 32	19 48
0 00	03 17	20 05

Variation

Variation.	Latitude.	Long. from <i>London</i> .
0° 40' East.	03° 58' South.	20° 27' West.
I 02	05 09	21 39
I 30	06 21	22 08
I 50	08 03	23 15
2 10	09 07	23 35
3 32	12 03	25 03
6 04	18 53	26 30
6 19	19 51	27 02
6 20	21 26	28 14
6 30	21 48	28 10
7 00	21 58	28 23
6 45	24 45	27 56
6 36	27 11	27 17
5 04	33 53	16 58
0 00	34 21	01 29. 30" East.
I 00 West.	34 15	01 33
4 16	33 41	06 23
8 46	34 39	13 02
II 56	34 30	16 15 <i>at the Cape</i>
II 30	32 51	13 41 <i>of Good</i>
IO 00	30 21	11 46 <i>Hope.</i>
09 44	29 51	11 44
09 34	29 28	11 31
09 22	28 56	11 05
09 04	27 38	10 01
08 30	26 55	08 45
08 03	25 41	07 22
07 32	24 32	05 43
01 52	16 00	06 30 West <i>at the</i> <i>Isle of St. Helena.</i>

VIII *Epistola, in qua ratio redditur Libri nuper editi, cui Titulus, De Arthritide Anomala, sive Interna, Dissertatio. Auctore Guilhelmo Musgrave, M. D. Coll. Med. Lond. & Reg. Societ. Socio.*

Viro Clarissimo, *Hans Sloane*, Med. Doct.
Regiæ Societatis a Secretis, S. P. D. *Guilh. Musgrave.*

DE *Arthritidis* in *Primigeniam* & *Symptomaticam* divisione, ad explicandum & tollendum multiformem hunc Affectum utilissimâ ; deque altero divisorum Membro, nimirum [*Arthritide Symptomatica* ;] in Dissertatione, annis abhinc aliquot, in lucem edita, disseruimus : Aliam, (Vir Clarissime!) nunc propono, non minus utilem, atque adeo necessariam *Arthritidis* Divisionem, in *Regularem* & *Anomalam*:

Quum *Arthritis* Actio sit Naturæ, in sui defensionem alienum aliquod è Sanguine proturbantis ; ea præcipue *Regularis* est habenda, quâ, ex Naturæ proposito, alienum id, in locum idoneum, modo maxime convenienti, ejiciatur Hoc autem apte ; hoc ægri summo cum emolumento, longæque amplissimo, fit in *Artubus* ; quos suapte sponte adit *Arthritis* ; quos sæpissime frequentat ; & in quibus, hæc de Causa, Sedem ponere judicetur *Regularis*.

Quoties autem *Truncum*, aut aliquam ejus Partem Organicam, invadit ea ; quando isthoc ex Naturæ sive imbecillitate, seu frustratione fiat, & in Ægri mortem, aut periculum sæpe definat ; hæc *Arthritis* appellari potest *Anomala*.

Posita

abeuntes, variis in Peripheria Punctis terminantur. E. g. *Colica*, *Phthisis*, & *Apoplexia*, quotiescunque Morbi sunt *Arthritici*, consentiunt in eo, quod *Arthritidi regulari* succrescant, & ex ejus Miasmate fiant, & committantur omnes : At quum Miasma illud nunc ad *Interanea* sit appulsum, ubi *Colicam* facit ; nunc ad *Pulmonem*, ubi *Phthisin* ; nunc ad *Cerebrum*, ubi *Apoplexiam* ; iccirco hujus *Colicæ*, *Phthiseos*, *Apoplexiæ* (id est, harum *Arthritidum Anomalarum*) Diagnoses partim ex *Intestinorum*, *Pulmonis*, *Cerebri*, nimirum ex locorum affectorum accidentibus sunt ducendæ : Atque hæc locorum internorum ab *Arthritide* in iis infixæ affectorum, accidentia, *Διγνώσκειν* harum est quod reliquum.

· Canon harum *Anomaliarum* Pathognomonicus, hic est generalis ; *Quo certior Arthritidos regularis ῥαγξίς, & ἰλι-
lius Materiæ, in ea, quæ intus sunt, quo postea certior est
Translatio ; eo confidentius Anomalam, & quidem in parte
nuperrime occupata, esse Arthritidem, possimus statuere.*

Ut autem *Arthritis Regularis* in *Provincia Exteriori*, five *Artubus* ; ita, in *Provincia Interiori*, five *Trunco*, *Anomala* alios aliis locos frequentius subintrat ; gravius adfligit ; & profecto tam multos, ut in omni *Trunco*, qui ea prorsus sit immunis, atque ex toto liber, vix reperiatur. *Ἄριστον, εἰς ὅσον ἔσται τὸ κινδύ.*

Causæ harum *Anomalarum* sunt, primum, Miasma *Arthriticum*, diu in Sanguine contentum ; jam autem exulans, & Parti in *Trunco* alicui *Organicæ* commissum : Deinde, Partis affectæ imbecillitas, five nativa, five casu facta ; qua, ad onus suscipiendum, præ ceteris aptum, & proclive reddatur. Atque hæc duæ Causæ sunt *Internæ*, & in *Anomaliis* hisce universis locum obtinent : Alia est *Externa*, & evidens Causa ; omne scil. quod Miasma, vel à τοῖς ἔξωθεν repellens, vel iis affigi prohibens, ad ea, quæ intus sunt, illud intrudat.

Differunt hæc *Anomalie* inter se, *ratione Loci*, five *subiecti*: Est enim alia *Ventriculi*; alia *Pulmonum*; alia *Cerebri*, &c. Tum *ratione Causarum*, quæ nunc remissius, nunc autem fortius agunt; &, diversis agendi modis, diversas (*ratione Magnitudinis*) faciant *Anomalias*: Tum postremo *ratione Materiæ*, quæ pura puta nunc *Arthritica*; nunc autem *Scrofulosa*; nunc *Scorbutica*; vel istiusmodi aliena est.

Medendi Indicatio generalis in eo consistit. ut *Arthritide Anomala* Pars affecta, quam citissime, quam tutissime levetur. Hæc autem fit, Materiam in ea depositam partim è Corpore evocando; partim in Artus, in locum minus nobilem & sedem suam, transferendo.

Evocatur è Corpore Materia interdum *Venesectione*; sæpe *Purgatione*; nonnunquam *Diaphoresi*; alias *Epispasticis*; modo *Anacatharsi*; interdum *Errhinis*, &c.

Præmissis, qua oportet, Evacuationibus, Curatio reliqua (quæ quidem hujus Dissertationis opus est præcipuum) optime perficitur, per Materiæ in Artus Translationem: Hæc enim ipsa Naturæ via est.

Ἡ δὲ αἴτια, ἢ αἰὲν μάστιγα πένη ἢ φθора, λαύτῃ ἀγνοίᾳ, διὰ τῶν ἔμπροσθεν κεκλιᾶται. Quæ ducenda sunt, eo ducendi, quo maxime Natura viam afficiat, per loca lege Naturæ commoda.

Et quidem huic *Arthritidis* Expulsioni eo potius suo tempore incumbendum; quoniam Materia, quæ, post Evacuationes, in sanguine solet *Arthritica* restare; quæque ceteroqui partem nuper affectam repetat; nullo quidem modo utilius, feliciusve, quam per Articulaamenta, possit extrahi.

Auxilia *Arthritidi*, in locis hujus *Anomaliæ*, ad 72 Art. re-movendæ, & in viam reducendæ apta, sunt tum *Interna*, tum *Externa*.

Interna, Arthritidem expellentia, five *podagregoria*, sunt è Class. Medicamentorum *Cardiaca* magna ex parte selecta; ut *Bulvis è Chelis C. C.* *Iberiaca Andromachi*, *Spiritus volatiles*,

tiles, Vinum, cum multis istiusmodi aliis : Quibus addi oportebit è Ferro Præparata, tanquam hac in re valentissima : Maxime vero placet Alcohol Martis, sive Rubigo ejus subtilissima ; quæ, ut reliqua omnia Præparata viribus æquare, ita quidem mollitie superare, unde Corporibus tellulis convenire reperitur.

En ejus *Ἐπερι* v.

R. *Limaturæ Ferri lb. x. Sartagine, vel Patella terrea, vitro obducta, Urina madefac humana ; æstivo sole, vel ad Ignem sicca ; iterumque (Spatula Ferri particulas, ne coalescant, bis in die agitando) irrorare ; donec abeat in Rubiginem Massu. Exeam, & Rubigine confectam eam, in Mortario ferreo contunde : Tusam, & in pulverem redactam, stulæ, quatuor circiter Congios Aquæ fontanæ continenti, injice. Pulverem cum Aquâ commisce. Horæ post quadrantem, Aquæ, quod summum est, & minus turbidum, leniter detrahe ; & ad pulveris, in ea natantis, siccitatem evapora. Quod in stula relictum est humoris, similiter evaporetur. Pulvis in fundo crassior Urina irroretur, &c. uti prius : Itaque Nutritio, Tritura, perq; Aquam separatio repetatur, donec omne Ferrum in Pollinem mutabitur. Chartæ Emporeticæ, Coni in formam circumvolutæ, Pulveres siccatos inde ; Aquam fontanam fervescant, paulatim, & per vices, superaffunde ; donec urinoso sale penitus abluto, exstillabit Aqua insipida. Pulverem denno exsicca, & usui serva.*

Ferrum hoc Nutritum est, sive Rubigo ejus subtilissima, merum Alcohol ; non solum Arthritide, verum etiam Chronicis plerisque aliis, ægrotantibus, præcipue teneris & imbecilibus utilissimum. Dosis ὄσς, semel, bis in die, pro te nata, cum veliculo idoneo.

Præter hæc communia, alia sunt Interna, quæ Anomaliis quibusdam singularibus occurrunt, & locis suis traduntur.

Si, ex *Internorum* usu, dies quatuor vel quinque continuato, nihil in Artubus Doloris, nulla *Arthritis* excitabitur; Articulo dolere solito, & sæpissime afflicto, vel quam proxime eum, applicetur *Empastrum*, aut *Ceratum*, aut *Phlegmum*; aliudve aliquod Materiam potenter eximens, & Tumorem elevans; cui denique Tumori, Methodo prædicta facto, *Epispasticum*, idque (si videbitur quod appellent *Perpetuum*, dies complusculos duraturum, admoveatur.

Hæc *Anomala*, sive *Internæ Arthritides* Medicina generalis: Ut autem clarius intellegatur, è multis unam, & alteram *Anomalam*, specialius exponam.

Materia *Arthritica* minime sic, ut par est, è sanguine in Artus emissâ; aut ex iis, causa aliqua evidenti & externa, retro acta, nunc *Ventriculum* (sive, ejus imbecillitate, sive reliquiis τῶν δυνάμεων, in eo congestis allecta) intrat. Hinc *Ανέρεξις*, *Nausæa*, *Vomitio*; hinc *Virium* paulatim *imminutio*, *Macies*, & demum post menses aliquot (serius citiusve, pro ægroti robore) Mors. Ut malo tam gravi, nec quidem raro occurratur, è re futurum arbitror (præmissa Catharsi, altera, vel utraque) *ποσάραγων* *internis*, hospitio novo, & cuique usurpato, Hostem exturbare, & in Artus pellere: Quam quidem operam, in hac *Anomala*, egregie præstant *Stomachica*, *Cardiaca*, & *Alexeteria* generosissima, frequenti & magna dosi adhibita: Quibus (si bidui, vel tridui spatio minime doleant Articuli) in subsidium veniant *Externa* modo dicta, *Articulis* creberrime dolentibus applicanda: Qua ego Methodo languidos, & marcescentes *Arthriticos*, certe non paucos, summo vitæ discrimine liberatos, sibi restitutos novi.

Simili modo *Pulmonem* aliquando virus infarcit, & corrodit *Arthriticum*; unde *Tussis*, *Sputatio*, *Faciæ pallor*, *Æstus Corporis Universalis*, *Phthiseos* scil. incipientis signa: Quam tamen, ne ingravescat, ut præventus, non id tam *Cortice*, Lacte & ejusmodi *Frigidis* (sic, ut in *Phthisi Primigenia*)

Primigenia) præstari posse ; quam *Calidioribus* ; *Balsamis* scil. & *Sulfure* præparatis ; quæ *Arthritida* partim, *Anacatharfi* expellant, partim ad τὰ Ἄρρα fugent, exploratum est.

Quinetiam in *Apoplexia*, quæ dicatur, *Arthritica*, morbo utique tam crebro, quam ancipiti, nihil *Cerebro* prope modum oppresso, secundum *Evacuationes*, magis opitulatur ; quam è *Capite* Hostem *Phœnigmis*, & ejusmodi educantibus, quasi *μοχλιδῆς* in Artus evellere.

Prophylaxeos ergo, tum in prædictis, tum aliis quibuscunque hujus generis *Anomaliis*, magni utique momenti est, *Materia Arthritica* ne in *Sanguine* renovetur ; renovata vero ne ἀνομαλως agat, diligenter curam adhibere.

Capitum ordo, & Inscriptiones sunt hujusmodi.

- Caput I. **D**E *Arthritide Anomala*, generatim.
 Caput II. **D**E *Affectibus Ventriculæ Arthriticæ*
 Caput III. *De Colica Arthritica.*
 Caput IV. *De Diarrhœa Arthritica.*
 Caput V. *De Dysenteria Arthritica.*
 Caput VI. *De Abscessu Intestinorum Arthritico.*
 Caput VII. *De Melancholia Arthritica.*
 Caput VIII. *De Syncope Arthritica.*
 Caput IX. *De Calculo Renum Arthritico.*
 Caput X. *De Asthmate Arthritico.*
 Caput XI. *De Catarrho, Tussi, & Peripneumonia Arthriticæ.*
 Caput XII. *De Phthisi Arthritica.*
 Caput XIII. *De Angina Arthritica.*
 Caput XIV. *De Capitis Dolore, & Vertigine Arthritica.*
 Caput XV. *De Apoplexia Arthritica.*
 Caput XVI. *De Paralyse Arthritica.*

Caput XVII. De Doloribus in Corpore vagis, fixis ; de Ophthalmia ; de Erysipelate ; & Achori-
bus Arthriticis.

Caput XVIII. De Epiphora, & Doloze Dentium Ar-
thritico.

Caput XIX. Corollaria continet, cum Epilogo.

Hæc sunt (Vir Clarissime!) Quæ de *Interna Arthritide*, Affectu non novo, sed cum magno humani generis incommodo à nostris Hominibus neglecto, lucubravi ; & quidem, quantum in me est, ad *Hippocratis* mentem : Ita enim Ille,

Καὶ τὸτο ἐν εἰδέναι χρὴ, ὅτι Ἀΐλας ἢ Νῆσος, ὅτε Μελαπίνην ἐς
ἐργον Νῆσιν.

Vale, *Vir Doctissime* ! Et *Societatem* summam, quæ decet, Observantia meo *Nomine* saluta.

Isæ Damnoniorum, 3 Idus Aprilis, MDCCVII.

IX. *An Account of a Book, intituled, The Whole Art of Husbandry. By J. M. Esq; F. R. S.*

THIS Book gives an Account of the several Ways and Methods about the Inclosing of Land.

The way of ordering and improving of all sorts of Pasture and Meadow Land, and of the overflowing and draining Marsh and Boggy Lands, &c.

The way of making of Hay, and the Management of Clover, St. Foin, and other *French* Grasses.

The ordering of all sorts of Arable Lands for all sorts of Grains; the making of several sorts of Ploughs, and the
different

different ways used in several Counties, for the improvement of Charkey Sandy, Gravelly, Stony, Clay, and other sorts of Land.

An Account of the several sorts of Manure used for the improvement of Land; as of Burning of Land, of several sorts of Marle, of Sea Sand, Dung, Ashes, &c. and what is properest and best for each sort of Soil, &c.

Of the ordering of the several sorts of Corn and Grain, as Wheat, Rye, &c. and what Soil is best for each particular sort, &c.

Of the several ways of preserving of Corn, the making of Graincries, and the ordering of each sort for Keeping, &c.

Of the several Methods used for the ordering of Beasts, Fowls, Insects, and other things necessary for the Stocking of a Farm.

Of such things as are Injurious to the Husbandman, with Remedies for the same.

Of the general use of all sorts of Grain; of several ways of making Malt, &c.

Of the several Instruments, Tools and Engines necessary for the Husbandman: Of Building and Repairs, and of the several sorts of Work belonging to the Husbandman, with the Cost and Charges of each.

Of the Benefit and Advantage of Timber Trees, and what Soils are best for each sort, and the way of Raising, Planting, and ordering of all sort of Timber Trees, and Coppice Wood, &c.

Of the Raising of Fruit Trees, the making of a Nursery, the several ways of Grafting, Inoculating, &c. the way of Cultivating the Ground, with Directions how to prune and manage each particular sort of Fruit, and a Catalogue of several sorts of Fruit, with particular Remarks on them.

Of the ordering of Vines, the making of Vineyards, and of *English* Wine.

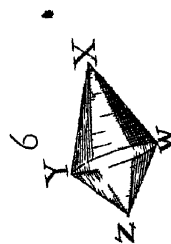
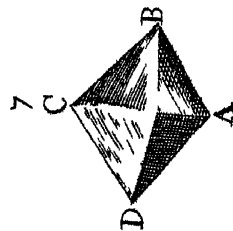
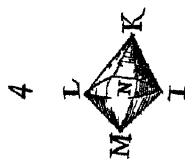
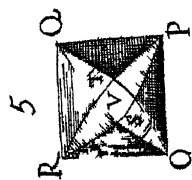
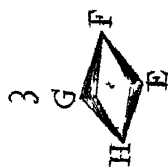
Of several ways of making *English* Liquors ; as Beer, Ale, Cyder, Mum, and several sorts of *English* Wines, &c. with many other Particulars, too long to be inserted here.

The whole Work contains a compleat Collection of what the Ancients and Moderns have writ about this Subject, and near a third part of it is new Experiments and Improvements ; giving an account of all the Ways and Methods used in several Counties, especially about *London* ; with a design to procure intelligence concerning the several sorts of Husbandry used in all Parts of *England*, in order to make a compleat System of it : Which the Author hopes all that are willing to promote so useful a Work will assist him in ; and he thinks what he has already done, will make it easie for any so to do, because he has therein stated the Practice of the above mentioned Places ; so that every one may readily know what different Methods, and what particular sort of Management, is used upon any sorts of Lands by either themselves or their Neighbours in the places where they live, which is not mentioned in the aforesaid Book, and by that means be easily able to give an account to the Publisher.

L O N D O N, Printed for *Sam. Smith* and *Benj. Walford*,
Printers to the *Royal Society*, at the *Prince's Arms* in
St. Paul's Church-yard.

27

FIG 1



(Numb. 311.)

For the Month of May, August, and September. 1707.

[illegible]

U. S. DEPARTMENT OF JUSTICE
F. B. I.

1. The Government has
2. The Government has
3. The Government has
4. The Government has
5. The Government has
6. The Government has
7. The Government has
8. The Government has
9. The Government has
10. The Government has
11. The Government has
12. The Government has
13. The Government has
14. The Government has
15. The Government has
16. The Government has
17. The Government has
18. The Government has
19. The Government has
20. The Government has
21. The Government has
22. The Government has
23. The Government has
24. The Government has
25. The Government has
26. The Government has
27. The Government has
28. The Government has
29. The Government has
30. The Government has
31. The Government has
32. The Government has
33. The Government has
34. The Government has
35. The Government has
36. The Government has
37. The Government has
38. The Government has
39. The Government has
40. The Government has
41. The Government has
42. The Government has
43. The Government has
44. The Government has
45. The Government has
46. The Government has
47. The Government has
48. The Government has
49. The Government has
50. The Government has
51. The Government has
52. The Government has
53. The Government has
54. The Government has
55. The Government has
56. The Government has
57. The Government has
58. The Government has
59. The Government has
60. The Government has
61. The Government has
62. The Government has
63. The Government has
64. The Government has
65. The Government has
66. The Government has
67. The Government has
68. The Government has
69. The Government has
70. The Government has
71. The Government has
72. The Government has
73. The Government has
74. The Government has
75. The Government has
76. The Government has
77. The Government has
78. The Government has
79. The Government has
80. The Government has
81. The Government has
82. The Government has
83. The Government has
84. The Government has
85. The Government has
86. The Government has
87. The Government has
88. The Government has
89. The Government has
90. The Government has
91. The Government has
92. The Government has
93. The Government has
94. The Government has
95. The Government has
96. The Government has
97. The Government has
98. The Government has
99. The Government has
100. The Government has

IV.

10/10/57

John Edmund of a, London, in the County of
Middlesex (after from the City of Venice in the County of
St. Anthony, in the County of New York, in the
United States of America, in the County of New York, in the

VI. _____

1. *Calva in Aqua, Boile, 8cc.*

1. The first step in the process is to identify the problem or issue that needs to be addressed. This involves gathering information and understanding the context of the problem.

1998, 1999, 2000, 2001, 2002, 2003, 2004, 2005, 2006, 2007, 2008, 2009, 2010, 2011, 2012, 2013, 2014, 2015, 2016, 2017, 2018, 2019, 2020, 2021, 2022, 2023, 2024, 2025, 2026, 2027, 2028, 2029, 2030, 2031, 2032, 2033, 2034, 2035, 2036, 2037, 2038, 2039, 2040, 2041, 2042, 2043, 2044, 2045, 2046, 2047, 2048, 2049, 2050, 2051, 2052, 2053, 2054, 2055, 2056, 2057, 2058, 2059, 2060, 2061, 2062, 2063, 2064, 2065, 2066, 2067, 2068, 2069, 2070, 2071, 2072, 2073, 2074, 2075, 2076, 2077, 2078, 2079, 2080, 2081, 2082, 2083, 2084, 2085, 2086, 2087, 2088, 2089, 2090, 2091, 2092, 2093, 2094, 2095, 2096, 2097, 2098, 2099, 2100, 2101, 2102, 2103, 2104, 2105, 2106, 2107, 2108, 2109, 2110, 2111, 2112, 2113, 2114, 2115, 2116, 2117, 2118, 2119, 2120, 2121, 2122, 2123, 2124, 2125, 2126, 2127, 2128, 2129, 2130, 2131, 2132, 2133, 2134, 2135, 2136, 2137, 2138, 2139, 2140, 2141, 2142, 2143, 2144, 2145, 2146, 2147, 2148, 2149, 2150, 2151, 2152, 2153, 2154, 2155, 2156, 2157, 2158, 2159, 2160, 2161, 2162, 2163, 2164, 2165, 2166, 2167, 2168, 2169, 2170, 2171, 2172, 2173, 2174, 2175, 2176, 2177, 2178, 2179, 2180, 2181, 2182, 2183, 2184, 2185, 2186, 2187, 2188, 2189, 2190, 2191, 2192, 2193, 2194, 2195, 2196, 2197, 2198, 2199, 2200, 2201, 2202, 2203, 2204, 2205, 2206, 2207, 2208, 2209, 2210, 2211, 2212, 2213, 2214, 2215, 2216, 2217, 2218, 2219, 2220, 2221, 2222, 2223, 2224, 2225, 2226, 2227, 2228, 2229, 2230, 2231, 2232, 2233, 2234, 2235, 2236, 2237, 2238, 2239, 2240, 2241, 2242, 2243, 2244, 2245, 2246, 2247, 2248, 2249, 2250, 2251, 2252, 2253, 2254, 2255, 2256, 2257, 2258, 2259, 2260, 2261, 2262, 2263, 2264, 2265, 2266, 2267, 2268, 2269, 2270, 2271, 2272, 2273, 2274, 2275, 2276, 2277, 2278, 2279, 2280, 2281, 2282, 2283, 2284, 2285, 2286, 2287, 2288, 2289, 2290, 2291, 2292, 2293, 2294, 2295, 2296, 2297, 2298, 2299, 2300, 2301, 2302, 2303, 2304, 2305, 2306, 2307, 2308, 2309, 2310, 2311, 2312, 2313, 2314, 2315, 2316, 2317, 2318, 2319, 2320, 2321, 2322, 2323, 2324, 2325, 2326, 2327, 2328, 2329, 2330, 2331, 2332, 2333, 2334, 2335, 2336, 2337, 2338, 2339, 2340, 2341, 2342, 2343, 2344, 2345, 2346, 2347, 2348, 2349, 2350, 2351, 2352, 2353, 2354, 2355, 2356, 2357, 2358, 2359, 2360, 2361, 2362, 2363, 2364, 2365, 2366, 2367, 2368, 2369, 2370, 2371, 2372, 2373, 2374, 2375, 2376, 2377, 2378, 2379, 2380, 2381, 2382, 2383, 2384, 2385, 2386, 2387, 2388, 2389, 2390, 2391, 2392, 2393, 2394, 2395, 2396, 2397, 2398, 2399, 2400, 2401, 2402, 2403, 2404, 2405, 2406, 2407, 2408, 2409, 2410, 2411, 2412, 2413, 2414, 2415, 2416, 2417, 2418, 2419, 2420, 2421, 2422, 2423, 2424, 2425, 2426, 2427, 2428, 2429, 2430, 2431, 2432, 2433, 2434, 2435, 2436, 2437, 2438, 2439, 2440, 2441, 2442, 2443, 2444, 2445, 2446, 2447, 2448, 2449, 2450, 2451, 2452, 2453, 2454, 2455, 2456, 2457, 2458, 2459, 2460, 2461, 2462, 2463, 2464, 2465, 2466, 2467, 2468, 2469, 2470, 2471, 2472, 2473, 2474, 2475, 2476, 2477, 2478, 2479, 2480, 2481, 2482, 2483, 2484, 2485, 2486, 2487, 2488, 2489, 2490, 2491, 2492, 2493, 2494, 2495, 2496, 2497, 2498, 2499, 2500, 2501, 2502, 2503, 2504, 2505, 2506, 2507, 2508, 2509, 2510, 2511, 2512, 2513, 2514, 2515, 2516, 2517, 2518, 2519, 2520, 2521, 2522, 2523, 2524, 2525, 2526, 2527, 2528, 2529, 2530, 2531, 2532, 2533, 2534, 2535, 2536, 2537, 2538, 2539, 2540, 2541, 2542, 2543, 2544, 2545, 2546, 2547, 2548, 2549, 2550, 2551, 2552, 2553, 2554, 2555, 2556, 2557, 2558, 2559, 2560, 2561, 2562, 2563, 2564, 2565, 2566, 2567, 2568, 2569, 2570, 2571, 2572, 2573, 2574, 2575, 2576, 2577, 2578, 2579, 2580, 2581, 2582, 2583, 2584, 2585, 2586, 2587, 2588, 2589, 2590, 2591, 2592, 2593, 2594, 2595, 2596, 2597, 2598, 2599, 2600, 2601, 2602, 2603, 2604, 2605, 2606, 2607, 2608, 2609, 2610, 2611, 2612, 2613, 2614, 2615, 2616, 2617, 2618, 2619, 2620, 2621, 2622, 2623, 2624, 2625, 2626, 2627, 2628, 2629, 2630, 2631, 2632, 2633, 2634, 2635, 2636, 2637, 2638, 2639, 2640, 2641, 2642, 2643, 2644, 2645, 2646, 2647, 2648, 2649, 2650, 2651, 2652, 2653, 2654, 2655, 2656, 2657, 2658, 2659, 2660, 2661, 2662, 2663, 2664, 2665, 2666, 2667, 2668, 2669, 2670, 2671, 2672, 2673, 2674, 2675, 2676, 2677, 2678, 2679, 26

1. De Conchy lijs
 valvibus 3 item
 Therms Phillippi
 Jos. Kamel.
 ver, Pharmacop.

L A G A N G
Indorum. Est
 rubris circumjectis d

2. Budiong. Bucca,
 candum periculum
 uritur.

3. Balic-gogeco. Mares
 & longiores mu
 casus.

4. Balic-gogeco.
 internae & de foris cune

5. Balic-gogeco. Mares
 & longiores mu
 casus.
 6. Balic-gogeco. Mares
 & longiores mu
 casus.
 7. Balic-gogeco. Mares
 & longiores mu
 casus.

12. *Trochus Luron.* albis maculis, nigro reticulato
 120 47. 13. *textus Gazophyl.* Naturæ & Artis Tab. 47. Fig. xi.
 121 *Diluvio* Indis. *Cochlea Pyramidalis* seu *Trochus inversus*
 122 ore est lato in pyramidem assurgente apice muricato in
 123 subplanam sedem coacto, palmaris, maritima, maculis
 124 albis majoribus in nigro reticulatam constituentibus.

13. *Cochlea calata.* Indis *Bunga* Gazophyl. Natur. &
 Art. Tab. 48. Fig. xii. *Cochlea Persica similis*, centio
 patum sinuato, apice brevi, ore ventricoli expansio ubi et
 125 sulcis transversis ad modum prominentibus calata, lavis
 126 ceterum, cinereo, luteo & sulco variegata.

14. *Cochlea leviter muricata*, ore latè in ventrem
 producto, exalbida subluteis maculis undatim trianguli-
 127 terintervè variegata.

15. *Tamongcay.* *Cochlea* marina vesca, parva,
 subrotunda, albiissima, & arena sarcla qua ut volunt ali-
 128 tur.

16. *Soso vel Susu.* *Cochlea* est parva, lutescens, vesca,
 subrotunda, fluviatilis. Cooperculo gypseo, levi & fla-
 129 vescente donata.

17. *Omaneg.* *Cochlea* ferme pugno suppar, noctu
 domus subrepens, & *Cochlea* multum strepitus causans;
 130 non est vesca.

18. *Biyoco.* *Cochlea* parva, parietes & arbores scan-
 dens, fluviatilis.

19. *Buhay.* *Cochlea* fluviatilis & campestris sat magna,
 insisterens arboribus & strepitum edens.

20. *Cochleas terrestres* vescas, quibus *Vince* abundanti,
 amplexu conglutinari & oviperas esse observavi. Lapi-
 131 us in *Bohemia* Anno 1684, cum serobiculo superimpositæ
 ova alba, orbicularia, parvò pilò paria excluderent. Ur
 rectè scribit *Antonius Felix Abbas* Marsiliensis apud *Mal-*
 132 *phigum*.

21. *Tangali* Indorum, alijs *Samong.* *Trochus* est desoris
 albida & rubente cretaceave tunica obductus, politus, ar-
 133 genteus totus ut *Mater Perlarum* Offic. orbibus subplanis,
 134 in apice subverrucosis.

22. *Lisbit*

18. Lisbit. *Trochus* est parvulus ponderosus quo
utuntur eum retium marginibus appendendo.

19. Salitay *Indorum*. Sunt *Pestines* German. Conch.
Sancti Jacobi vel Peregrinorum, modo tenuissime carnis
striatim imbricati jam minus varieq; decoris striati
tigue. Interne argentei, margine Corallino bructi.

20. Talaba. *Ostreum* est ordinarius sepium
ferum.

21. Conchæ *Tiquassay* facies externa *Kime'*, Gazor Nat.
& Art. Tab. 45. Fig. iii. *Ostreum* est oblongum
grum tenue bivalve fragile, faxis & *Martiporis* interens.

22. Calantipay. *Ostreum* tenue & delicatum.

23. *Taclobo* *Indorum*. *Ostreum* est maximum bivalve.
striatim carinis palmaribus aut latoribus imbricatum ru-
gosum & asperum. Hujus speciei esse videtur *Imbricatum*
Tridacnes Aldrovandinum, & illud de quo *Johnstonus*.
Maris Borneoci quod carnis habebat 47 lib. Monstruosum
est quandoq; & ponderosissimum ita ut sæpe *Indos* captos
perire faciat, alij vero brachio vel pede mutilati eradant.
Non semel carne unius 30 & 40 *Indorum* saturati fuere.
Horum unum cum aliorum Conchyliorum multitudine
visitur in altissimo monte *Amandivi*, quod hominem pe-
centem & quatuor capit aquæ urnas. Perlæ si non potius
Lapides dicendi in his inveniuntur formæ teretis, magni-
tudinis digiti, non nihilum pellucidi.

24. De Conchis & Conchyliis quæ numerosa & præ-
grandia in summis montium jugis reperiuntur varij varia.
An non & ab aereo vertice a proximo mari sublata, illibi
rupto vortice dimissa spargi possunt?

25. *Buca*. Species est *Taclobo* minoris.

26. *Lattiau* *Indis*. *Concha* *Margaritifera* major perele-
gans & selectissima. Pedem Geometricum longa, tota
nitide argentea, ferens uniones pulchros, magnos selecti-
mos deferitur ex *Playa Honda*. Et hanc si matrem Per-
larum *Margaritis* substituere licet, ut censet *Serapio*, *Ron-*
deletius & *Pelesius* substituerem, a similibus siquidem prin-

cipio similes sequuntur effectus. Harum quoq; (acri lixivio decolores membranas separando & alterum ex materia Cretaceâ abradendo) purgatarum pulverem in usu Medico ipsarum Margaritarum locum optimi supplere posse cenet *M. Lister* in append. ad Hist. Animal. Angl. *Gordartio* annexo. addens sane quantum scio, accommodatissimus est, ad Medicamenta quævis, in quibus requiruntur vel ipsa Margarita vel Oculi Cancerorum dicti vel ipsum Corallium. Margaritam *Ovi Gallinacij* magnitudinis videre erat in *Jolo* circa *Tabrabu* quam præter Indos plures, vidisse affirmavit *Petrus Durian de Montforte* Hispanus, Vir fide dignus.

27. *Corculum* ex *Latriau* effectum habuit proliferum.

28. *Unionem* proliferum prossidet.

29. *Massabay*. *Concha* est *blaguisfera ordinaria*, seu Officinarum *Mater Perlarum*, *Spithamea*, argentocærulefces, perlas habet pulchras, numerosas, parvas communiter, invenitur ubertim in *Pararas*, *Giguan*, *Balanguan*, & *Portu Acapulco*, &c.

Fig.

30. *Baliad* alijs *Banchul*. *Concha* est *bivalvis*, ferme *spithamea* ex subplano-recurva, ad marginem interne polita, fusco purpurea vel maculis ejusdem coloris sparsim variegata, deorsum exalbida quasi squamose & undatim imbricata. *Perlas* gignit, sed exiguas, & inæquales, abundat in *Giguan*.

Fig.

31. *Lampyron* vel *Tipay*, vel *Cappis*. *Concha* est *bivalvis* plana, tenuis rotunda, ferme *spithamea*, lævis, candida & pellucida, materie constans prope eadem ac *Baliad*, seu fissili ut *Alumen plumosum*. *Perlas* aliquando generat sed pallentes & minutissimas. In *Luzon* vitri loco deservit pro fenestris. Pulverem aceto forti & calido subactum laudant ad tumorem testium & *Herniam* aquosam.

Ufus &
Vires.

Fig.

32. *Dilab*. Indorum. *Mytilus* est *niger maximus*, seu *Concha nigra* pedalis aut cubitalis longitudinis, interno splendens et perpolita, deorsum modicum scabra & paucis quibus-

quibusdam quasi imbricatim unguibus aspera, cæterum
 matris Perlarum tenuior; Animal *Indis* in cibum venit, ^{1374.}
 sed si non optime coctum fuerit, inebriat. *Unus* parit
 atras ac *Succinum nigrum*.

33. *Concha Luzonis* tubularis virescens, *Gazoph. Nat.*
 & *Art. Tab. 32. Fig. ix.* *Concha* caudata *Kameli.* Boca ^{G 17. N. 100.}
 de *Paco Hispan.* i. e. *volturnus Anatis.* *Balay Indis* ^{& A. 1. Tab. 32. Fig. ix.} *Fig.*
Udpan 3. c. *Conchula* est arctissime clausa, unciam lata,
 biuncium longior in modum rostri *Anatis* aperibilis, ad
 nexum palmo longiorem, candidum, duriculus, car-
 neam, & fistularem habens caudam cujus extremo ut
Hirundo faxis hæret; Animalculum formæ ferreæ est pre-^{Vires.}
 sentis crudum, eficitum Febrim inducit, corpus inflat &
 pruritus causat, editur probe coctum.

34. *Concha caudata altera.* Candida est, similis *Con-*
chæ longæ, sed brevior obrotunda, solidior & latere hians, ^{Fig.}
 cæterum priori similis.

35. *Calangcalangan vel Bacacay Bys.* *Conchæ* *Chamæ,*
 tineis multis, obliquis & cavis & piloso musco obductæ.
an nigra Bellonij? Pro Calce paranda pro *Betele.*

36. *Alayan.* *Tellina* species, venditur una cum *Ba-*
cacay.

37. *Cabebe.* *Mytilus* fluviatilis.

38. *Tabon.* *Musculj,* *Concha* longa tenuis, de foris fusca,
 splendens interne violacea & lævis ut externe.

39. *Cabilj.* *Musculus.*

40. *Luna.* *Musculus.*

41. *Halaan.* *Musculus.*

42. *Paros.* *Musculus.*

43. *Locan.* *Musculus.*

44. *Bulaburgat* *Indorum.* *Concha* est *Corallina,* de foris
 pectinatim, imbricatimve aspera, interne colore *Corallino*
 fundus inumbratur.

45. *Altera lævis striata,* tantum pectinatim, de foris ex-
 albida interne striatim argentea.

46. Sifi. *Balani* sunt *Gygantis* magnitudinis *Pomi* *Mis-*
n'acj striati figuræ nidi avium, asservo binos Coralloide
 cerulea *Bagangbang* conculo. *Gazoph. Nv. & Art. Tab.*
 10. *Fig. 8.*

47. *Patella*. Est *Patella* parte latissima, palmari,
 desoris nigra calbata gyplea; interne levissima & apren-
 dens, cujus fundum subfusca quasi *Pomus* *Indorum* seu
Alnus figura inumbrat, à qua novem lati & magis de-
 luce nudi radij & totidem albicantes sese distindunt ad
 marginem usque.

48. *Talacón*. Est *Patella* in vertice squammosa, ad mar-
 ginem fetis quasi *Porcinis* stipata.

49. *Lapas Indorum* est *Hujas Carina* *Nauis*, i. John-
 ston. *Patella fera* seu *Auris marina*. Oblonga tenuis ri-
 tide argentea, palmam longa, sesquimunciam lata.

50. *Altera* crassa est subrotunda desoris fusce rubens
 interne argentea, forma & magnitudinis qua eleganter
 in *Ephem. Medic.* Decade annorum Secunda Anni quarti
 depingitur.

51. *Busci*, *Bulago*, vel *Bulabo* *Indorum*. Est *Concha*
Veneræ pugno major, in albedo, pulo paribus & fuscis ma-
 culis varia, cæterum lævis & subrotunda utrumq; ubi in
 se recolligitur denticulata.

52. *Altera*, ubi in se recolligitur pariter utrimque den-
 ticulata, ibidem subplana & fusca; in gibbo vero a pri-
 mum subfuscis & totidem albis fascijs picta dein in iisdem
 varijs maculis interstineta.

53. *Tertia*, Ubi in se recolligitur uno tantum latere &
 leviter denticulata, altero ovalis interne fusce rubens, ex-
 terne tota candida. an *Malimacan Indorum*?

54. *Sigay*. *Concha* est *Veneræ* parva, *Moneta* *Siamen-*
sium.

55. *Pinapagi*. Species *Sigay*, sed candida.

De Mineralibus Fossilibus & Thermis Philippinensibus.

1. *Carbolum Petrifactum*, coloris aquæ purissimæ, Cambiciæ, Lactis, Testarum, Succini insistentis & loturæ candidum, ut est p. communis ementatorum colorum in uno, collegi anno 1688 in monte *Umatag*, insulæ *Sancti Pauli* *Quarum*. Deseruntur et puto torrentiam copia ex *Meliterre* in litus, ubi cum *Laba Manti* - *an* - *er* collegi.
2. *Diamantes*, in *Olon* enodiuntur, minus preciosi.
3. *Singul. alj.* Gemma rubens med.æ estimationis.
4. *Cabogin.* *Cornerina* Hispan. Est *Orychinus*, deseritur *Borneo* & *Gumaca*.
5. *Batobalani vel Paulhinangay.* *Magnet.* in *Paracalensis* eruntur territorio.
6. *Cancer* de Haynan: *Lapideus* est cum aceto dissolutus, et inunctus inflammationes & tumores reprimit. ^{irres} Hauritus Febribus, diarrheis, Dysenterijs, Colicæ & Cholera morbo medetur. *Dosis* ʒʒ ad ʒj.
7. *Cancer Petrifacti* inveniuntur et in Fluminibus *Paracalensis* una cum ligno *Molavia* & *Canva Indica vera* petrefactis. Ut in torrentibus *Paracalensis* et *Albayensis*.
8. *Lapis Conchyormis* & *Cochlea-formis* ex fontibus *Juratan* pro *Bezoar* habetur, uti et ille tunicatus torrentis *Tunassan*.
9. *Ceraunia Cruciformis.* In Provincia *Panay*, in territorio *Damalag*, circa montem *Pangtalon*, cum fulmine deliciuntur *Crucis Lapideæ* perfectissimæ, coloris dilute cærulescentis aliæ, aliæ obscure, magnitudinis sequiuncialis.
10. *Glossopetras Melitensibus* similimas, effossas & collectas in Provincia *Hilocos* Manilam attulit *D. Thomas Caruzalegui* ubi Indi eas cum fulmine deijci referunt, & *Linguas Fulminis* vocant. Venenis hæ non resistunt. *Plinius* et alij apud *B. Casium* eas Lunâ deficiente de cælo decidere

decidere tradunt. Hinc *Schroderus* post *Cerauniam* collocant.

11. Lapis Frigidus de Cananor. *Lusitanis* Pedra fria, *Lapis* est *Nephritico* magis durus, facie fissilis, coloris palaris, viridescentis, & prassini, quandoq; filamentosus, ut *Alumen plumosum*. Laudant contra Febres & Diarrheas.

12. Lapis Nephriticus Chinenfis. *Sinis* Sia. Afferitur in vasa majora, & animalia elaboratus, coloris terrej; lutescentis, flavi, viridescentis, subpurpurei, albicantis & rubris strijs variati & subulsi, nigricantis, & ex varijs coloribus commaculatus, commendatur ad dolores Nephriticos, & ardorem urinæ.

13. Lapis Quadratus. *Lusitanis* Pedra du ferro. Coloris inter *Magnetem* & *Hamatitem* medij, Figura quadrangularis unde nomen, confractus non nisi in partes quadratas visitur. Inter duorum digitorum ungues in gyrum versatur. *An Species Magnetis*, vel *an Siderites Plinij*? Liquor in quo circumactus, aut attritus fuerit, Vipera- rum & aliorum venenatorum succurrit ictibus potus, & illitus. Ad Partum facilitandum, foetum mortuum educendum, secundinas pellendas; menses & urinam ciciendam, grumos sanguinis extravasati deturbandos propinatur idem liquor, vel inungitur Oleum, in quo attritus fuit, vel integer lapis saemori alligatur. In Cephalalgia, Odontalgia, Ventriculj cruciatibus, Melancholia, Cholera morbo, Colicis & Iliacis doloribus, Stomachi repletionem prodesse & alvum laxare serunt, similiter ad Diarrheas, Dyfenterias & Tenesmum commendant. *Liber de simplic. Medic. Galeno* attributus. Habet *Lapis Quadratus* in *Egypto* invenitur & est exalbidus. *Tiros* habet viscidas & stringentes unde conceptum vitare dicitur, &c.

14. Lapis Specularis Antipolunus. Abundat in montibus *Paynam*. Candidus est, fragilis, in angularia & nientia fragmina diffiliens, non tamen in bractæas scissilis.

15. Lignum Molavin Petrefactum asservo *Paracalense* exalbidum, corticem versus subfuscum, sublustrè & *Pruteo* compar

compar soliditate. Ipsius Ligni pectinibus striatim.

16. Alia *frustra* habui coloris subglauci.

17. *Aliud* frustrum affervo *Palicpicanum*, verum non videtur esse Ligni *Molavin* sed potius Ligni *Gaiexo*. Coloris æruginosi, corticem versus luteo & rubente & fusco varium, pectinibus minus rectis quasi interruptis.

18. Popal. Cerussa.

19. Tavas. Alumen.

20. Terra Chinenſis *Lokamſig*. Alba, odorata lapidescens & aqua non diffluens est.

21. Terra Mexicana *Montis Jesus*. Fusca est bituminosa, saponis instar pinguis & lævigabilis, aqua non diffluens.

22. Terra argillacea alba, *Medullæ Lunæ* accedens, *Creta* candidior nec uſta nigrefcens. *Savonglupa* Indis.

23. Terre Argillacæ variorum colorum, ut in montibus Thermarum calidarum *Lacus Bay*.

24. Bolus communis. *Barha* Indis.

25. Ochra *Europæe* similis.

26. Gypsum eruitur *Tunassanam* ad flumen. *Anapog* Indis.

27. *Guancebamba*, de quo *Calantzæ*, Lapis est albus crescens in faxo nigro *Peruvij*, ac si viveret. Valet ad Ulcera, Vulnera, Hæmorrhagias, Diarrheas, Dysenterias & Dysuriam. *an* Species Lactis Lunæ? Vires.

28. *Bezoar Minerale* Siculum, *alijs* Polvos de Funda caro. Terra est *Lapidea* coloris ex albido cinerej ponderosa. Operari volunt suaviter per secessum, vel per urinam, vel sudorem vel insensilem transpirationem. Pro-pinant cum liquore conveniente horis medicis, bis aliquater per Diem, pondere ʒij pro Dosi. Dilaudant ut Panacæam universalem ad omnes morbos, specificè vero contra Febres malignas, continuas, intermittentes, tertianas & quartanas. Ad Flatuum molestiam, Diarrheas, Dysuriam, mixtum. Sanguinis, Erysipelata, Impetiginem volaticam, Pruriginem sudamina, Herpetem, Scabiem,

biem, Leporam, & alios affectus cutaneos . lino et ob-
structiones, sed quisq; suo abundet sensu, ego saltem
nunquam insignioribus obstructions laborantibus. Hoc *Be-
zoar*, vel *Caspar Antonianum*. vel Nicholao Manuchianum
exhibui, vel exhiberem, quia scio plures horum frequen-
tiori usu plus damni quam utilitatis reportasse, quod non
contingit ex usu *Lap. Bezoar* veri, ut pote substantia ma-
gis solubilis.

In Auriferis montibus *Buraguen* invenitur.

29. Flos Sulphuris Nativus, seu Mineralis levis, ni-
veus, insipidas & quasi solubilis : *An Species Lactis Laniæ ?*
Ubi hic efflorescit, subjacet Lapis durus, albus, hinc in-
de subnitens, ex parvis conglomeratus fragminibus, insi-
pidus : *Floris Mater*.

30. Sulphur Nativum, vivum, seu virgineum, solare,
leve, citrino aureum, splendens, & pellucidum in fragi-
libus glebis.

31. *Sulphur Minerale*. Sanaya & Matilang Indis. Est
purum virens, ex quo liquato addito oleo fit fuscum, cu-
jus quotannis circiter Centarij colliguntur & distra-
huntur.

32. *Porog*. Indis B. *Sapo Tag. Terra Sigillata* rubra, bu-
tyracea, accedens Auxungiae solis, quâ *Aurum* tingunt.

33. *Thermæ Calidæ*, in Provincia *Albay*, ad montem
excelsum ignivomum. Ibidem flumen, quod 24 horarum
spatio, *Plantas, Ligna, Pisces* in *Lapides* convertit.

34. *Thermæ Calidæ* ad *Lacum Bay*, Aqua salubris, la-
gena una evaporizata, relinquit falis subfulci, albescen-
tis. *Dij*.

35. *Thermæ Calidæ* ad montes *Buraguen, Paynan & Pa-
racale*.

II. *An Account of an Experiment, touching the Quantity of Air produced from a certain Quantity of Gunpowder Fired in common Air; by Mr. F. Hauksbee, F.R.S.*

I Took a fine Glas Tube about 36 Inches long, the Diameter of its Bore about three quarters of an Inch: Its upper Orifice had a Brass Ferrel solder'd to a Screw cemented on it, to which was screw'd a Cock. The lower or bottom part was naked and open (without the Bladder made use of when I made the Experiment before the Society, for I since found that to be needless): near the upper part of this Tube within, was fixt a piece of Cork, notch'd on its Edges, to give the greater liberty for the Explosion to vent it self. The Cork had a small Cavity in its middle, the better to receive and hold the *Gunpowder*, which was let down on it, through a small Glas Funnel, before the Cock was screw'd on. In this manner the lower Orifice was plung'd under the Surface of a Vessel of Water; the Cock being then screw'd on and open, it was easie, by sucking at it with ones Mouth, to remove the inward Air, whereby the Pressure of the outward Air would raise the Water in it to any determinate height: The Tube before being measured by an accurate Cubical Inch, and graduated by a File on its outside. When the Water had ascended to the design'd Marks by the prementioned Means, the Cock was turn'd, which suspended it there: Then the Force of a burning Glass being call'd on the Powder, it soon burst, blowing the Wa-

ter down violently, but suddenly rising again, rested so much below the Mark it stood at before firing, as was equal to the Quantity of seeming Air produced from it. The quantity of *Gunpowder*, used in this Experiment, was one exact Grain Weight; and I found the quantity of space the Water had deserted, just after the Explosion, was equal to the bulk (nearly) of a Cubical Inch of *Gunpowder*, whose Weight was 222 Grains: So that 222 Grains Weight of the same Powder, as soon as fir'd, seems to produce something to possess the space of so many Cubical Inches of Air. Now whether the space deserted by the Water is possess'd by a Body of the same Weight and Density, or is of the same quality of common Air, I dare not determine; Since an Experiment I have lately made, to try how much the heat produced by the Explosion of the *Gunpowder*, might contribute to the largeness of the space dispossessed by the Water, seems to conclude it otherwise: For I found that when the *Gunpowder* had been fir'd an Hour, the Water had ascended about $\frac{2}{5}$ of the whole deserted space, which was in length about $2\frac{1}{2}$ Inches, and was equal to about a Cube Inch in quantity: The space in length was divided into 20 equal parts; at two Hours after firing, it had ascended near $\frac{1}{4}$ of the same. By that time I judg'd it might become of an equal degree of Temperature with the outward Air: But still continuing the Experiment, I found (to my great surprize) that two Hours after the last Observation, the Water had reach'd to about $\frac{1}{2}$. Next Morning, which was at about 18 Hours distance, I took notice it had arrived to near $\frac{2}{3}$, or half of the first deserted space. Thus continuing rising, I found that at the end of 12 Days, the Water had ascended something above $\frac{2}{3}$ of the same. At 18 Days it had arrived to 19 of the 20 parts at first deserted; and at that Station it continued without alteration for 8 Days: So that the seeming real Air, produced

duced from the fir'd Grain weight of *Gunpowder*, was equal but to the bulk of 11 Grains of the same; that Number being nearly the 20th part of 222, the Number of Grains contain'd in a Cubical Inch, as aforesaid. Which shews that the whole space at first deserted by the Water upon firing the *Gunpowder*, was not supply'd with real Air. The Temperature of the Air I all along considered, and found it contributed nothing to this odd Phenomenon, which how to account for I know not; I only suggest, that the Springs, or Constituent parts of the Ambient Air, as well as those contain'd in the Body of the *Gunpowder*, may, upon firing, be capable of being broken, or at least so Distended, as to possess so large a space, and require so long a time to recover their Natural State again. And this, I presume, could never have been discover'd but by the confinement of the same Air in which the Explosion was made.

And as this Discovery is altogether new, so the Application of it may be as useful. But I shall wholly leave that to this Honourable Society, who best know how, most aptly to apply it.

Notwithstanding the Account of this Experiment seems to Run-counter with the Accounts formerly given of the firing of *Gunpowder* in *Vacuo*; yet considering the different Mediums in which the Experiments were made, they may be the easier reconcilable: For when the *Gunpowder* was fired in so thin a Medium as the near approach to a *Vacuum*, that then the remaining Air in the Receiver could suffer by the Explosion, but in proportion to the Quantity, which must be so inconsiderable, as not to be taken notice of. Besides, when I come to repeat those Experiments, I doubt not but I shall discover some Occurrences that were then past by unheeded, that may render them more agreeable to this last, than they now seem to appear.

III. *An Experiment shewing, that the Springs or Constituent Parts of Air are capable to suffer such disorder, by a violent impulse, as to require time to recover their Natural State ; by Mr. Fr. Hauksbee, F. R. S.*

THE foregoing Experiment, being so very odd in its appearance, gave me the Curiosity to enquire a little farther into the matter of Fact, and to try whether Air could be capable of being Wounded, (if I may call it so), or to suffer such a disorder of Parts, by a violent impulse, as to require time to recover their Natural State : I devised the following Experiment.

I took my Condensing Engine, (which is so well known to this Society, I shall not need to describe it here) ; into the bottom part of its Brass Receiver I put about half a Pint of Water ; then the upper part being screw'd strongly on, I threw into it, with the Syringe, about 3 or 4 Atmospheres of Air (as near as I could guess), suffering it to remain in that state sometime more than an Hour ; then letting out as much of the Air (by taking off my Syringe) as would readily depart, I immediately screw'd on in its Place a Box of Leather Collars, through which past a small Glass Tube, whose lower Orifice was plung'd under the Surface of the included Water. I found in a very little time the Water had ascended in the Tube near a Foot, and continued rising

rising for some time, till it had reach'd near 16 Inches ; which plainly shews, that the Springs of Air, by being somewhat over bent, do not presently (altho at Liberty) recover their Pristine State. And were they to suffer a more violent compressure, and to remain for a Week, Month, or a Year, in the same State, I doubt not but according to the length of time, and degrees of Condensation, a proportional time would be requir'd to recover them to their Natural State again. But what is the Force made use of in this Experiment, in comparison to that of Fir'd *Gunpowder*, where the suddenness, and violentness of the Impulse, is unaccountable ; however, it serves well to confirm the Suggestion I had, that Air might so suffer in its Parts by Force or an Unnatural Extention of them, as to require time to recover their Pristine Natural State.

Upon a Repetition of the same Experiment, only the Condensed Air remained in the same state, as at first injected, for about 18 Hours : then letting out the Air as before, the Premention'd Box with its Tube was screw'd on ; and upon Observation I found, that as the Springs of the Air did unbend themselves, so they press'd more and more on the Surface of the included Water, which rais'd it higher and higher in the Tube, as they approach'd nearer their Natural State. This continued for about 6 Hours, at which time the little Tube was accidentally broke, and our farther Observations for that time frustrated.

IV. *Part of a Letter from Dr. Archibald Adams of Norwich, to Dr. Edward Tylon, Fellow of the College of Physicians and Royal Society ; concerning a Monstrous Calf, and some things observable in the Anatomy of a Human Ear.*

I Have made what search I could about that Monstrous Calf, and I find that its Dam was all that a Poor Man had, who finding his Cow unable to cast her Young, employ'd his Neighbour to assist her ; this Man not thinking of any such Rarity us'd such violence upon the Monster, that he disfigur'd the Head in pulling it from the Cow ; notwithstanding it liv'd three Hours, and in all probability had lived till this time, if the Assistant had made use of the best Method in that case, and so by destroying the Owners All, might have sav'd him an Estate : then it Dy'd, and being Rip'd up was found, to the best of my Information, to be in all respects like any other of the same kind, excepting the Wings, which to me seem to be Bags formed out of the Membranes, torn and distended from the adjacent parts, and by fresh supplies from the circulating Fluids were enlarg'd to the bigness you now see them in. Whether the Substance contain'd in these Baggs was Fibrous and Muscular, or only a heap of Vessels inclosed in a *Cystis*, like the *Placenta*, The Assistants Ignorance, and the distance of time and place, it being three Years ago, make me incapable to account for : The place is called ~~Wickham~~ *Wickham* in Norfolk. .

[The Skin of this Calf is now in the Repository of the Royal Society in Gresham-College, given to the same by Dr. Adams.]

Give me leave to write one thing which to me is altogether new. The boney Cavity of the Ear is covered at each end by a Membrane ; the former is called the Membrane of the Drum, and the other is directly opposite to it ; the outer is stronger than the inner, so I call them with submission. They are joined together by the handle of the *Malleus* adhering to the outer, and the upper part of the Stirrup to the inner, which by the intervention of the *Incus* and the Orbicular Bone make a Chain, and they seem to be acted and re-acted by these small Bones reciprocally.

Whether Artists had any respect to this Original, when they first devised Drums, I cannot say ; but nothing can more nearly represent the Natural than the Artificial does ; the Skins of this answering to the Membranes of that, the Wooden Cylinder to the Boney Cavity ; the sound of the Drum would be flat without a Hole in the side, and Nature has given a passage from the Palate to the Ear. The Skins of the Drum would lessen the sound, if they were not kept on the stretch so would those of the other flag, if the handle of the Hammer and the Stirrup keep them on not the Temple. This inner Membrane is closely stretch'd before the Labyrinth, the *Foramen rotundum*, and the passage into the *Cochlea*, (I omit the *Foramen Ovale*, because the Foot of the Stirrup exactly shuts it), that so the sound may be the bigger upon its approach to the Nerves. The Stirrup is generally broke in dissecting the Ear, particularly that Cover which goes over the Bone on each side ; but if it be carefully open'd, the Stirrup is entirely covered with a Membrane, which forms a Capsule flatly Oval and the inside is Excavated.

*V. An Extract of a Letter to his Excel-
lency Signior Francisco Cornaro, Am-
bassador from the Republick of Venice,
to the Queen of Great Britain, &c. By
Anthony Van Leeuwenhoek, F.R.S.
Containing Microscopical Observations of
the Salts of Pearls, Oyfter-shells, &c.*

I Thought it my Duty to testifie my Thankfulness by
these few Lines, and therewith to join some of my
poor Observations, &c.

Pearls are prescribed as a very wholesome Medicine upon
divers occasions to such as are able to pay for them.

Now in order to make a Trial of the supposed Vir-
tues of Pearls, I took seven little ones, all which being
laid in a row together, did not exceed the length of an
inch.

Then I put them upon a *Steele Smiths Chafin*
Fire, and made them Red-hot; after which I threw them
into clean Rain Water, which caused them immediately
to burst in pieces; whereupon I took the Pearls and

put them into a Glass Tube, and placed the Tube over
a small Fire, till the Pearls were both Red-hot and
smoke.

The Pearls there arose in
Smoke, and a yellowish Oyl straved
from them.

Those Oily particles stuck upon the sides of the
Glass Tube, and were divided into several
small Globules, that several times together

did not amount to the length of a single Grain of
Salt. In other places, the Pearls of Oyl were
When

When the Glafs Tube where the Pearls lay began to melt, I threw thofe pieces of them that were burft with heat into clean Rain Water, and after they had been feveral Hours in the faid Water, I poured it upon a clean Glafs Plate, that it might evaporate; and that being done, I difcovered abundance of Salts that were coagulated in Rose-like Figures of feveral Magnitudes, and each of them different, infomuch that I could not prefcribe any particular figure, only that I faw afterwards lying a great number of very flender and long Salt-Particles, fome of which exceeded the others both in thinnefs and length; upon another Glafs there were a great number of Salt Particles coagulated in Figures like Branches and Boughs of Trees, which was a very agreeable Object, but there was nothing more remarkable therein.

I took about two thirds of the faid Water and mingled it with one third of my Blood, which I drew out of my Thumb with the prick of a Needle; and having fo mingled it, I placed it before a Microfcope, but could not difcover that the Globules of Blood were coagulated in any other manner than when Blood is mingled with common Water.

The pieces of *Pearl* that came out of the Glafs, and had been thrown into the Water, as is before mentioned, were not White, but Blackish; whereupon I caufed the Water, in which thofe Fragments lay, to evaporate, and they being dry, I put them upon fuch a ftrong Fire of Charcoal, that they turn'd White again; whereupon I threw them again into clean Rain Water, and thereupon obferved, that a great many Particles of them feparated themfelves from one another, and funk to the bottom, in appearance, like white Chalk.

Thefe Fragments of *Pearl* having lain a little time in Water, I obferved a Scum to overfpread the fame, which in my foregoing Obfervations I had not feen; and after a few Hours, that Scum grew thicker, and then I per-

ceiv'd that it was nothing else but the coagulated Salt Particles, the figures of which at that time I could not discover; from whence I concluded, that the Salts, of which *Pearls* are partly composed, cannot be dissolved but by a violent Fire, or in strong Waters, and that *that* Heat that I had brought upon the *Pearls*, when they were in the Glass Tube, was not strong enough to separate the Salt Particles.

I took a drop of Water, which was very clear, from under that Scum that I told you before was composed of the Salts of *Pearls*, and I put the same upon a clean Glass, and observed in the space of two Minutes, that there was, as it were, a new Scum drawn over the said Water.

The next Day this Water was wholly evaporated, and where it had lain thickest, there was nothing to be seen but a white Matter, as it appeared to the naked Eye, but in reality, there was an incredible number of exceeding small Salt Particles, which for the most part were so strongly coagulated, that there could be no particular Figure discovered in them, but where the Water had lain thinner, there the Salt Particles were coagulated in the form of Boughs and Branches of Trees.

Now, forasmuch as the Water, in which those burnt *Pearls* lay, was mostly evaporated, I put some fresh Water upon them to try whether the Salts would not coagulate in larger Figures.

After this Water had been about a Minutes time poured upon the *Pearl* Particles, and that I judged them to be sunk to the bottom, the Superficies of the same Water was again covered with another Scum.

I then took a little of that Water also, as clear as I could, from under the Superficies of it, and put a little thereof upon two very clean Glasses, and presently discovered a new Scum spreading over the same, which according

according to all appearance, was nothing else but the coagulated Salts.

After that the burnt Fragments of *Pearl* had been infused in this Water two or three Days, I discovered a few large Salt Particles, like the first mentioned Salts, and of divers Figures, some of them were as clear as Chrystal; and I could likewise perceive in some of the small Salts, that lay at distance from the rest, their particular Figures, and they also were as clear as Chrystal, but where they lay thicker together, they appeared to the naked Eye to be nothing but a white Matter.

After these burnt *Pearls* had laid about five Days in the Water, their Salts had such an influence upon *Copper*, as to turn it Green in several Places.

In order to be further satisfied, I took some of the above-mentioned *Pearls*, and folded them in a thick Post Paper 4 times double, and beat 'em upon an Anvil to Powder; then I put the Powder into a little clean Copper Porringer of a Hemispherical Figure, and poured clean Rain Water upon the same, then set it over the Fire and boiled it till two thirds of the Water were evaporated.

I took some of the Water, and put it upon clean Glass Plates, in order to see how far the *Pearl* Powder had impregnated the same with its Salt Particles.

After that this Water had stood some Hours, it seem'd to me as if there was something floating upon it, but when I view'd it with a Microscope, I could not judge it to be any of the Salt Particles, but rather small whole *Pearls*.

The Water that I had placed upon clean Glasses having been exhaled, I view'd the remaining Particles with my Microscope, and saw several exceeding small Salts, of the same Figure with the former.

For further satisfaction, I caused the said Copper Porringer to be well cleaned, and poured in as much Rain Water, as had lain upon the broken Pearls, and then set it over the Fire again, and boiled it till two thirds were wasted ; then I put the same Water upon clean Glasses in order to evaporate, to the end that I might see whether there were as many Salt Particles in this Water, as there were in that, wherein I had infused the Powder Pearls, but the difference was so little that it was not worth naming.

But as the Salt Particles of both the last mentioned Waters were so soft, that when they were coagulated in dry Weather, my Breath alone was sufficient to reduce 'em to a Watry Vapour ; on the contrary, the Salts that were coagulated from the burnt Pearls, were so inflexible, that I imagined, they could not be dissolved any other way, than by Fire, or very sharp Waters.

Now since we see, that notwithstanding the boiling of Pearl Powder in Water, so few Salts are extracted from it, that its hardly worth the speaking of ; we have a great deal of reason to believe, that the Stomach and Bowels have a much less power over the Pearl Particles that are given to Sick Men ; and as for what belongs to the Salt Particles, wherewith the Water is impregnated by burning of the *Pearls*, and which coagulate in the Water, like a petrified Matter, we ought to believe, that those do rather prejudice than profit our Bodies ; and the more, because the Juices, that remain in the Stomach and Bowels, do so coagulate the Salts of those Meats and Drinks which we make use of, that few or none of them mingle themselves with the Blood, but are discharged with the rest of the Excrements ; and those Salt Particles, which do not coagulate, we ought for the most part, to look upon as bad as Poison, and especially those which put our Bowels into such a motion, as to protrude the Chyle too hastily : This is plainly seen in
the

the Sea-fishes, which tho they swim in Salt Water, and always receive the same into their Stomach and Bowels ; yet none of the Salts mix with their Blood, but coagulate in such a manner in the Stomach and Guts, that they assume the figure of Diamonds, and pass through their Bodies, together with the Excrements.

In short, we may conclude, that *Pearls* are useless, and that there is no manner of advantage to be had from them in the way of Medicines, and consequently that they are good for nothing else but to empty Rich Mens Pockets of their Money ; and I must needs own that I have the same opinion of Gold too, tho I have often heard that mightily cry'd up by some People, and so again is Silver by others.

But those that have dissolved Gold and Silver, and know how they coagulate again, and consider moreover, that Gold is 18, and Silver 10 times heavier than our Blood ; they know, that altho Gold and Silver could enter into the Blood, (which yet is unconceivable,) it can never be assimilated or mingled therewith ; now if this be true, 'tis plain that the aforesaid Mettals do only serve to enrich those that prescribe them.

To return again to the business of the *Pearls* ; I view'd them again with my Microscope, and observed that the scaley Particles, of which the *Pearls* were composed, were much thinner than they had appeared before.

I imagined also, that in some of the *Pearls*, I could see the very place, where they had been joined to the Shell, and at which they received their Nourishment and encrease, vvhich I suppose to happen after the same manner, as the Gall-Nuts are produced upon the Leaves of *Oaks* ; that is to say from a superfluity of Matter, or else from Wounds or Obstructions in the Vessels.

Novv, since *Pearls* are produced as it were accidentally (and after the manner abovementioned) in the Shells
of

of *Oysters*, there is no doubt but that they have one and the same Salt Particles, and consequently that their Operations are uniform.

For my farther satisfaction, and for want of those *Oyster-Shells*, in which *Pearls* are found, I took two Shells that had been for four Years together nailed upon the Bulk, of a Man that sells *Oysters*; upon a supposition, that I should find no kind of Salt Particles in such Shells, and moreover, that they were as dry as the *Pearls* themselves.

The biggest of those *Oyster-Shells* I judged to be six Years Old, and that the thickest part of it was something more than one sixth of an Inch.

I split this *Oyster-Shell*, and observed several Scaley Particles of it to be of a shining whiteness, something like what we call *Mother of Pearl*; and when I view'd these Particles with my Microscope, I observed that the little Scales, of which the *Oyster-Shell* is composed, to be as thin as those that *Pearls* consist of.

Yea, I judged that the Scaley Particles of the *Oyster-Shells* lay as many times upon one another, as the *Oyster* was days old: In another place instead of Scaley Particles, there was nothing but (as it appeared to the naked Eye) a white Chalkey Matter.

These Scaley Particles are composed of exceeding small Vessels, by which they certainly receive their increase from the Fish, and which extend themselves so many several ways, that it was impossible for me to follow them with my Eye: Now, as I said before, it is possible that from an over-flowing of Nourishment, &c. there may be such a matter protruded, as shall afterwards be coagulated and turn it self into a hard Globular Figure.

Moreover, I took some of the inmost split Particles of the *Oyster-Shell*, which were very clean and white, and put them upon a Fire of Charcoal, and having made
 to them

them glowing hot, I threw them into clean Rain Water, whereupon the Particles of the Shell were separated from one another, and appeared like Meal or Ghalk; and presently after, I observed a Scum overspreading the Superficies of the Water, which increased and grew thicker from time to time, and which plainly appeared to be nothing else than the coagulated salt Particles; and when this Water had stood three Days, there was such large salt Particles coagulated, and composed of so many several Figures, and so clear, that 'twas a Pleasure to behold them; and tho after that time, by stirring and breaking that Scum, I had caused it to subside to the bottom of the Water, and had poured more fresh Water upon the said Particles of the *Oyster-Shell*, there succeeded quickly after a new Scum, but it was not near so thick as the first.

Now if the common *Oyster-Shell* has such an Analogy with the Particles of *Pearls*, we cannot doubt but that Shell which produces *Pearls* has yet a much greater likeness, so that we may well conclude, that *Pearls* are of no real use in Physick; and who knows, that most of those Physicians who put such a value upon *Pearls*, *Gold* or *Silver*, with respect to their use in Medicines, did ever set themselves, to make a nice enquiry into the Powers of them, but only contented themselves with a servile imitation of others.

Furthermore, I took some of the inmost parts of the said *Oyster-Shell*, and proceeded with them after the same manner as I had done before, with the broken *Pearls*; that is to say, I boiled them in Rain Water, and observed likewise that the said Water had no Scum upon it.

I caused this Water to evaporate, and then observed more salt Particles in that than in the Water above-mentioned; and these Salts were so soft, that my warm Breath alone was sufficient to turn them into a Vapour:

The *Heer Peter Valkenier* had presented me formerly with a large piece of an *Oyster-Shell*, which was found upon the high Mountains of *Switzerland*, where it had lain, in the Opinion of some Persons, ever since the Flood ; this Shell was not White, but rather of a dark Grey ; it had been scaled or worn away very thin, and in the Cavity where the Fish lay, there was a little piece of another *Oyster-Shell*, as it were cemented to it, and when I separated it with some violence, there lay a yellowish Clay in several little Holes or Pits in the *Oyster-Shell*.

I broke off a little piece of the said Shell, and making it red hot, threw it into clean Rain Water, and then observed that most of the Particles, that were separated from one another, were like a white Chalk ; and I could perceive in the space of a Minute, that upon the Superfices of the Water there was an exceeding thin Scum, which from time to time grew thicker, and which I separated several times from the Water ; but it appeared to me to be nothing else than coagulated salt Particles, which after two or three Days time were not only grown much larger, but in some few of them I discovered as exact figures, as I mentioned before in the first *Oyster-Shell*.

Now, since an *Oyster-Shell*, had lain so many Years in the Earth, and remained there without being disposed to Corruption, 'tis plain that the preservation thereof was owing to those fix'd salt Particles, of which it was partly composed, and which could be no otherways divided than by Fire.

Delft, December 18, 1705.

VI. *Part of a Letter written to Signior Antonio Magliabechi, by Mr Anthony Van Leeuwenhoek, F. R. S. concerning the Particles of Silver dissolved in Aqua Fortis, &c.*

Delft, March 12. 1705.

I Take the liberty to acquaint you, Honoured Sir, that I communicated to you some Months ago my Opinion concerning *Diamonds*; the sum of which was, that they do not grow bigger by lying in the Earth, but that their magnitude and figure is assumed at once, and at the very time of the coagulation or coalescence of the Particles which compose them.

I was the more confirmed in this my foregoing Opinion, by putting Silver (which I have done several times) into a Glass Tube, that was about the thickness of my Finger, and length of my Hand; upon which Silver I poured as much *Aqua Fortis*, as was sufficient to dissolve it.

I put this Glass Tube, which was a third part filled with *Aqua Fortis* impregnated with Silver, into a Pot filled with Sand, and placed it almost Horizontally, and so as that it might not stir any way, in hopes that I might the better observe, (after a few Days,) the coagulating Particles, subsiding to the bottom, all along the length of the Tube.

Having view'd this Glass Tube with a *Microscope*, I observed divers small long Particles coagulated, which I judged to be Particles of *Salt Petre*; for as I turn'd the Tube a little before my Eyes, and as gently as I could, I put those Particles into a little Motion, and thereby at once discover'd three sides of them, which I imagined to

be the half of those Bodies, and consequently that they were of an Hexangular Figure; they appeared also as clear as Chrystal.

I saw a few long Particles, some of which were inclining to a Red, others to a Peach Colour. I further observed exceeding small Particles, that had the figure of polish'd pointed *Diamonds*; others were coagulated more irregularly.

Hereupon I took a second Glass Tube, and proceeded therewith as I had done with the former, and let it lie longer, and put a little Fire under the Pot that was filled with Sand, to the end that I might cause the said Diamond-like Particles to coagulate more largely.

After that, I poured the said *Aqua Fortis* gently out of the Glass Tube, so as that the coagulated Particles might remain in it; and then I turned the Tube with the Orifice downwards, that all the moisture might drain out of it.

Having done thus, I view'd the Tube through a *Microscope*, and saw that there stuck a great number of Chrystalline Particles on the inside of the Glass, of which several were an hundred times bigger than those which I had observed in the first Glass; then I separated with a small Copper Wire the Particles that lay together, in order to distinguish them the better, and saw with great amazement the abovementioned Chrystalline Particles, lying together like a heap of *Diamonds*, all of 'em as it were of a Hexangular Figure, and having each of them two sharp Hexangular Points; they were of several Magnitudes, and in one place we saw them scatter'd, in another lying on a heap. In a word, it would have been impossible to have disposed any real *Diamonds* before the sight of our naked Eyes, after such a manner, as to exceed this Phenomenon.

I could not then discover among these wonderful coagulated Silver Particles, that had assumed a Chrystalline Nature, any Salt-Petre Particles: I shew'd them to several

ral Gentlemen, who view'd them with great Attention ; among the rest there was a *Jeweler*, who seem'd to be struck Dumb at the sight, and said, that it would be impossible for any five Mouths to declare the Wonders that he had seen.

Now, to be more sure that the abovementioned coagulated Chrystalline Particles were real Silver, (tho I made no doubt of it my self) since *Salt Petre* and *Copperas*, from whence *Aqua Fortis* is Distilled, do never produce such Chrystals, at least in all Observations that ever I made of them ; I took some of those Chrystalline Particles, and laid them upon a piece of Wood-Coal, and with the flame of a Wax Candle, which I blew upon them, put them into such a Fusion, that they presently became round Globules, which Globules were plain visible Silver.

Herenpon I sent for a *Painter*, who in his Youth had also been a *Silversmith*, and caused him to view those Chrystalline Particles thro a *Microscope*, and when I had told him what it was that he had seen, he burst out into this Expression, *Good God ! What Wonders are these ?*

I made him draw one of those Silver Particles of the same size with those, whereof I had discover'd great multitudes in my first Observation ; see Fig. 1. between A and B.

As also another Chrystal Particle represented by Figure 2. C.D.

Figure 3. EFGH. shews you another Chrystalline Particle as it lay just opposite to the sight, wherein you might observe at EG the beginning of the slanting of the six sides which end in the points of F and H.

Fig. 4. IKLM is likewise a Silver Particle turn'd into Chrystal, in which one would imagine that one saw between K and M (as it is describ'd at N) a Quadrilateral plain or flatness, and that IN and NL, parts of the little Chrystal, were also flatish ; and this appears more visibly

sides, the point WXY seems to be much larger than the opposite point WZY; The occasion of which, as I suppose, was that the point WZY lay undermost, and near other Chrystalline Particles, whereas the point WXY lay uppermost, and consequently admitted more freely the coagulation of its Parts.

Fig. 7. ABCD represents another Chrystal, which appeared to be an uncommon Figure to the Eye of the *Painter*.

Fig. 8. ABCDEF is another Chrystalline Particle, where in the Hexangular side CDE is very short, like that slanting part represented by EFABC, of which FAB runs into a much shorter point in proportion than the uppermost part does; I observed a great many other such Chrystalline Figures. Now 'tis possible that these Chrystalline Figures, which are bent a little crooked, might be so shaped at the time of their coagulating by my moving the Glafs, and laying it in such a posture as is before mentioned, and which was also probably the reason, that the pointed part FAB had assumed that form that is represented in Fig. 8.

I placed another Chrystalline Figure before the *Painter*, which was bigger than that represented by Fig. 5; two sides of which were encompassed with, or rather there were coagulated upon them abundance of exceeding small Chrystalline Particles lesser than those of Fig. 1. AB; in these one could discover but one small point, so that 'twas impossible for the *Painter* to give us a full view of such very small Particles.

Not content with the aforementioned Observations, I took anew two other Glafs Tubes, something larger than the former, into which also I poured *Aqua Fortis*, and then threw in some fine Silver; whereupon I whelmed the Glafs Tube upside down, and placed it in warm Sand, so the end that the *Aqua Fortis* should dissolve as much Silver as it was capable of; and after that this *Aqua Fortis*,
thus

thus impregnated with Silver, had stood some few days, and the upper part was become very clear, I decanted the clear Water, and poured it off from the Silver (that still lay in it) into another Glass Tube; and turning the Orifice downwards, I kept it in that Position fourteen Days, almost always in warm Sand, in order to try whether the Chrystalline Particles would not by this means coagulate bigger, but I could not observe that they did; And as for the second Glass Tube, that fell out of the Sand in the Night and broke to pieces.

After this, I took a little of the *Aqua Fortis* that was impregnated with Silver, and having weaken'd it with common Rain Water, I put some of it upon a clean Glass, and spread it over the Glass as thin as I could; and then put upon the said Glass, a small Particle of red Copper no bigger than a Grain of Sand; and presently view'd it with my *Microscope*, and observ'd, that the Silver Particles were coagulated out of abundance of almost invisible Particles in the said Water; and tho I view'd those Particles with a Glass that magnified them as much as possible, yet they were unconceivably small, that I could perceive nothing else, but that these slender Particles were made up of other Particles yet smaller; but tho I observed them never so nicely, I could not discover their Figures, even after their coagulations.

Now as we see these small Chrystalline Particles (which are really Silver) coagulated into such exact pointed Hexangular Figures, just as if they were so many polish'd *Diamonds*, and that these Figures grew larger and larger; we cannot doubt but that those Chrystalline small Particles have the same form, even before they are obvious to our sight.

Now, let us compare the coagulated Silver Particles, which are all of 'em, as it were, changed into Hexangular Chrystalline Figures, with the pieces of Rock Chrystal, which are likewise all Hexangular, and we shall observe, that

that the first coagulations of the Rock Chryſtal are exceeding ſmall as they are congealed out of the Air ; and from time to time, ſo long as that matter is in the Air, it preſerves the Figure which it had in the beginning, unleſs it be hindred by other Particles lying about it, as we may in ſome manner obſerve in the coagulated Silver Particles, which tho they have lain ſome Months within the Glaſs wherein they were coagulated, during a very Rainy Seafon, yet I could not diſcover the leaſt alteration in them.

Now it ſeems very ſtrange, that moſt of the Rock Chryſtals are Hexangular, and end in an Hexangular point; and tho ſome of them are ſlanting and almoſt flat, where they are joined to the Rock, yet one end or point of them is likewiſe Hexangular ; But when we ſee with our Eyes *Salt-Petre* diſſolved in Water, and united with it, and afterwards coagulating therein, we ſhall diſcover all the exceeding ſlender and long Particles thereof to be of an Hexangular Figure, excepting ſuch which coagulating in a heap together are irregular ; and as the Chryſtals end in an Hexangular point, ſo the ends of theſe *Salt Petre* Particles run into a flattish or *Beetle-like* Figure.

So we daily ſee in coagulated Sugars, that we call *Sugar Candy*, moſt of their Particles to be of a Quadrilateral Figure, of which two of the oppoſite ſides are often broader than the other two, and that the ends of them, when they don't ſtick to other Sugar Particles, run into a ſharper *Beetle-like* Figure.

In ſhort, we ſee that the coagulated Silver Particles appearing like Chryſtals are all of them Hexangular, and end in two ſharp points, and that the Rock Chryſtal is almoſt always of the ſame Figure ; and moreover, that *Salt-Petre* does alſo coagulate into Hexangular Figures with a *Beetle-like* ſharp point ; but why ſome coagulate one way, and others another, is a thing unconceivable in my Opinion, and which can no ways be accounted for.

I did

I did likewise put a little Gold into *Aqua Regia*, and placed the Tube, in which the said Water and Gold was, in warm Sand, to the end that as much Gold as was possible should be dissolved ; but I could observe no coagulations in it, but only in some Particles branching out, the Figures of which, by reason of their smallness, I could not perceive. But as to the mingled Salts, of which *Aqua Regia* is composed, viz. Salt-Petre, Vitriol, and Sal Almoniac, I saw abundance of their Salt Particles coagulated ; all which had the figures of exact square *Diamonds*, having two sharp and two obtuse Angles ; they were of different Magnitudes, some so small that they were hardly to be perceived with a *Microscope*, most of 'em as clear as Chrystal, excepting some very small Particles that lay upon them which had no transparency.

Fig. 9. Three of those *Diamonds* of several sizes are represented by ABC, DE and FG, in which we could perceive a thickness, and the *Painter* has described it accordingly : We saw likewise some few Oblong four-sided Figures, with two acute and two obtuse Angles, as in Fig. 10. HI.

I imagined that in the abovementioned Figures there was no Gold at all, because I scarce ever discover'd any such Figures in *Aqua Fortis* impregnated with Silver.

There lay moreover upon, and about the said *Diamonds*, long ChrySTALLINE Figures, which I conclude were Particles of Salt-Petre.

VII. *An Account of a Book, Intituled, A Voyage to the Islands of Madera, Barbadoes, Nieves, St Christophers, and Jamaica ; with the Natural History of the Herbs and Trees, Four-footed Beasts, Fishes, Birds, Insects, Reptiles, &c. of the last of those Islands. To which is prefixed an Introduction, wherein is an Account of the Inhabitants, Air, Waters, Diseases, Trade, &c. of that Place, and some Relations concerning the Neighbouring Continent and Islands of America. Illustrated with the Figures of the Things described, which have not been heretofore engraved, in large Copper Plates as big as as the Life. By Hans Sloane, M. D. Fellow of the College of Physicians, and Secretary of the Royal Society. In two Volumes in Fol.*

The First Volume.

THE Author of this Work, having, as he intimates in the Preface, a great desire to satisfy his Curiosity, and improve his Knowledge, by making particular Observations in some parts of the *West-Indies*, whence a great part of the *Materia Medica* is brought to us, as likewise to view and examine the things themselves in their Natural and Vegetating state, laid hold of an occasion that offered it self, and accompanied the Duke of *Albemarle* as his Physician in those Parts ; which gave him an opportunity of making these Remarks, which he has obliged the Inquisitive with in this Volume, which contains but one part of the designed Work of *A Natural History of Jamaica* ; nor is it wholly confined to that Island, since he inserts several curious and useful Observations in other adjacent Parts, as he had any convenience of making them.

In the Preface he tells us of an Indisposition during the most part of his Voyage thither, that hindered his observing

several things, which otherwise we might have had an account of. Here he tells us his way of preserving the Specimens of his Plants, and owns he was obliged for the designs of many to one Mr. *More*, a *Clergy-man*.

This first Volume, after a large Introduction and Observations made in the Voyage thither, contains a very particular and accurate description of the Herbs growing there, with the Figures as large as the Life, curiously drawn and as well Graved: Thus far in general: I shall observe some few particulars, and refer the Curious to the Book it self for a full information.

In the Introduction he informs us of some particulars of the first Discovery of the *West-Indies* by *Ch. Columbus*, and of this Island in 1494; and by the way observes, that the first Ship brought home the *French Pox*, before unknown in *Europe*, with its wonderful spreading in a few Years.

As to the situation of *Jamaica*, it lies S. W. of *England* 1500 Leagues; it has to the E. *St Domingo*, about 35 Leagues, and to the N. *Cuba*, about 20, to the S. *Porto Belo*, and to the S. E. *Santa Martha*, each about 140 Leagues distant.

Next he gives the Names of the Rivers (which are generally Rapid and Muddy) both on the N. and S. sides; observing there is a Ridge of Hills running E. and W. through the midst of it.

As to the Barometer, he found the same variations there as with us in *England*; with some other Observations of the Air. Then he treats of the *Waters*; observes an hot Spring, salt Springs, &c. He found the Soil of their *Savannas* answer our *Meadows*. Treating of their Food, he observes that Flesh sometimes corrupts very soon, except Salted; and here takes occasion to speak of their feeding and managing their *Swine*; another part of their Food is *Turtles* and some other *Fish*. Here he speaks of *Cassada Bread*, and the wonderful change made in it by Baking, it being raw a rank Poisson. Then

Then follows a Digression concerning the extraordinary power of the Stomach, in converting so many different sorts of Food into good Nourishment; with a particular account of the different Foods of several Nations and People.

Treating of their Drink, he says Water is the chief, as also the most wholesome, disapproving vinous and strong Liquors; and observes that *Cyder, Beer, &c.* brought from *England* doth not keep there: mentioning several other Drinks used there, with their good and bad effects.

Their chief Exercise is Riding in a Morning, as well as the Healthiest. Frost and Snow are never seen there, but in the Inland parts sometimes great Fogs; they have two Rainy Seasons, *viz.* in *May* and *October*.

Here follows a Journal of the Weather from *May* the 2d, 1688, to *March* the 17th, 1689. This is succeeded by an Account of the Winds, as Monsoons, &c. Earthquakes generally happen once a Year, and Thunder daily in the Mountains.

The Inhabitants are for the most part *Europeans*; some few *Creolians, Indians*, and the *Negro-Slaves*; the Natives having been all formerly destroyed by the *Spaniards*.

Then he treats of their Cloathing, Houses of the *Planters* and *Negro's*, of their *Work-houses, &c.* Speaking of the *Negro's* and their manner of living, he observes their Mirth, Singing, Musick and Dancing, with their Lasciviousness; as to the *Negro's* Physick, Cupping with *Calabashes*, and Scarifications are frequent; they know little of the use of Simples, or the Method of Curing a Disease; they have a Custom in most Cases, of daubing the Sick Person all over with wet *Clay*, and setting him in the warm Sun.

He gives some account of the Trade of *Jamaica*; and coming to speak of the Punishments of the *Negro's*, he says, tho they may seem severe to us, yet they are but necessary for so stubborn a Race of Mankind.

As to the Beasts, he observes the Horses are but small, fine-shap'd and swift, but weak ; of black Cattle there were formerly many wild, but at present there are but few, except what they breed.

Travelling the North-side of the Island, he found there the Ruines of a large City called *Sevilla*, with a Church that had never been finish'd ; here he met with an Inscription of *Peter Martyr*, &c. near this Place is a fine Harbour.

After this is an Account of Capt. *Phipps* Journal for the *Wreck*, with other Remarks.

Next follows an Account of the Diseases he met with there during his stay, and observes they are much the same as here ; he gives us the method he used in the Cure, with the Success of his Prescriptions.

He concludes with the relation of his Voyage thither, and the Observations made in the same ; and speaking of Sea-sickness, disapproves the common Practice of some to take at Spring and Fall Preventive Medicines, it often bringing on Illnesses, in probability they would never have been troubled with.

Here he gives the Description and Figures of several *Fishes* and *Birds* he met with in his passage, as the *Hirundo Marina Major*, the *Grampus*, *Porpesce*, *Caravel* a sort of *Zoophyte*, *Dolphin*, *Shark*, *Boneto*, *Remora*, *Flying Fish*, *Tropick Bird*, *Man of War*, *Booby*, *Noddy*, &c. with the Plants observed at *Barbadoes*, and the other Islands.

Lastly, follows the Natural History of *Jamaica* ; and in this Volume he treats only of the *Herbs*, which he distributes into 17 Chapters.

1. Of *Submarine Plants*, of which he describes 42, giving their Figures as big as the Life, and refers to the Catalogue of *Jamaica* Plants, publish'd by himself in Octavo 1696, where he gives the Synonyma with great Knowledge and Industry ; the same Method is observed in all the following Chapters.

2. Of

2. Of *Mulbromes*, *Mosses*, &c. in all 26.
 3. Of *Ferns* and *Capillary Plants*, in number 103.
 4. Of Herbs with Grassie Leaves, of which he names 57.
 5. Of Herbs with less perfect or stameneous Flowers, in all 52 ; particularly of *Long Pepper*.
 6. Of Herbs with a Monopetalous Flower, of which are 47 ; particularly of *Tobacco*, with its good and bad Qualities.
 7. Of verticillated Plants, of which there are but 14 that grow wild.
 8. Of Leguminous Herbs, or with a Papilionaceous flower, in all 30.
 9. Of Herbs with flowers consisting of 2 or 3 *Petals*, 12.
 10. Of Herbs whose flowers have 4 *Petals* or Leaves, 26.
 11. Of Herbs vasculiferous with Pentapetalous flowers, 25.
 12. Of Herbs which are of the Kind of umbelliferous Plants, 6.
 13. Of rough Leaved, or asperifolious Plants, 5.
 14. Of Herbs commonly accounted to have many naked Seeds, 24.
 15. Of Bacciferous or Pomiferous Plants 42.
 16. Of Bulbous rooted Plants, or with 6 or more *Petals*, amongst these he reckons the *Aloe*, of these there are 20.
 17. Of Herbs whose flowers are composed of several flowers, of which Tribe he gives 30.
- This ends the *First Volume*.

VIII. *A Letter from Mr William Baxter to Dr Hans Sloane, R. S. Secr. containing an Account of a Book Intituled, Archæologia Britannica, giving some account Additional to what has hitherto been Publish'd, of the Languages, Histories and Customs of the Original Inhabitants of Great Britain : From Collections and Observations in Travels through Wales, Cornwall, Bas Bretagne, Ireland and Scotland, By Edward Lhuyd, M. A. of Jesus College, Keeper of the Ashmolean Museum in Oxford. Vol. I. Containing, 1. A Comparative Etymology ; or, Remarks on the Alteration of Languages. 2. A Latin-Celtick Dictionary : or, a Vocabulary of the Original Languages of Britain and Ireland. 3. An Armoric Grammar. 4. An Armoric - English Vocabulary. 5. Some Welsh Words omitted in Dr Davies's Dictionary. 6. A Cornish Grammar. 7. A Catalogue of British Manuscripts. 8. An Essay towards a British Etymologicon. 9. A brief Introduction to the Irish or Ancient Scottish Language. 10. An Irish-English Dictionary. Oxford, Printed at the Theatre for the Author, MDCCVII. And delivered at the Ashmolean Museum.*

I have carefully perus'd this First Volume of Mr Lhuyd's *Archeologia Britannica, or Glossography* ; and am bold to say that nothing in this kind has appeared in Publick, within my knowledge, this Century to be compared unto it ; whether we consider the Elaborateness of the Work, the

the Skill and Judgment of the Compiler, or the usefulness of it to illustrate the most Ancient part of our History ; and trace out the Original Inhabitants, and *Brigantic* and *Belgic* Colonies : Similitude of Languages, and of Rites and Religious Opinions, being by that great Author of Historiography, *Herodotus Halicarnassensis*, deservedly accounted the most established Rules for such Discoveries. The Ingenious and Learned Author has very candidly and truly represented his own undertaking in his *English Preface*, and in that curious Letter written to my Lord Bishop of *Hereford* ; to which I refer you. In his *British* Epistle to his own Country-men, he delivers his very weighty Reasons for altering the Vulgar Alphabet of the *Welsh* ; and justifies it from the Authority of Ancient M S S. and Inscriptions upon Stones in several parts of our Country. Next he Learnedly refutes the Opinion of the *Saxons* receiving their Alphabet from *Austin* the Monk, and shews that the same Characters are still extant on the Tomb-Stone of *Kadwan* King of *Gwynedd* in the Church call'd *Llan Gadmaladar* in the Isle of *Anglesey*, who was one of the *British* Princes in that Famous Battle of *Bangor is y coed* fought against those *Saxons* whom *Austin* had influenced to Massacre the *British Monks*. Indeed all the Sepulchral Inscriptions in Mr *Camden's* *Britania* abundantly prove the use of the *Roman* Alphabet in this Noble Province, from whence the Ancient *British* or (as now commonly call'd) *Saxon*, and *Irish* Alphabets are very small Deviations, unavoidably introduced by Time and the Arbitrary use of Writing. What he next proceeds to, seems much more owing to his Modesty than of any real necessity : I mean his excusing the time he employ'd in this great Undertaking ; for that may well seem to any Judicious and Impartial Person, to have rather been the product of an Age than of those few Years since his return from his Travels. What he says for putting those Four Languages into one Book is very reasonable ; in re-
gard.

gard none of these very Ancient Dialects can be adjusted, but by being compared with the others. The *Scottish* Language (which by a large List of words in the *Basque* and *Irish* is here sufficiently demonstrated to be a branch of the *Old Spanish*) he shews to be intermixt with the Ancient *Gwydheleg* or *British-Irish*; as also that these *Gwydhelians* were the most Ancient Colonies of *Galls* here, and probably forced by the Ancestors of the *Britans* into *Scotland* and *Ireland*; the *Picts* being by the *British* Writers term'd *Gwydhyl Fichted*; and *Irish* words such as *Uyflg*, *Ban*, *Lhuch*, *Prim*, &c. still continuing to be Names of *British* Rivers and Mountains: as also numbers of words (such as *Corlan*, *Bliib* and the like) in the present *British*, whose Etymologies are only found in the *Gwydhelian* or *Irish* Dialect, now disguised by the *Scotic*. This *Gwydhelian* Tongue he Learnedly proves from Ancient *Celtic* words, and Names or Places in the *Roman Geography*, to have been also the Language of *Gaul*. For my own part, I must confess, I look upon our *British* (the Origin whereof he defers till another occasion) to be a Branch of that Ancient *Belgic*, that was spoken by the *Galli Senones*, who possess'd all the lower parts of *Germany*, until the Invasion of the *Kimerian Saxons* or *Kimbrians* from the *Palus Maotis*, whence our *Celto-Scythæ*, or present *Germans*, of which see *Possidonius* in *Strabo*. Lastly, he does not only prove by the Authority of the *Triades*, (a small *British* Tract written according to the Judgment of that most Learned Antiquary Mr *Robert Vaughan* of *Hengurt* about a Thousand Years ago) that there was a very numerous Colony made in very early Times out of Great *Britain* into *Vasconia*; but also confirms by a large Catalogue of *British* words in the present *Gasgoin*, the mixture of both People, even there as well as in *Ireland*. His *Comparative Etymology* is so Methodically, Artfully, and Judiciously digested, so admirably projected by the best Canons as well of

Critique

Critique as of Grammar, that it recommends its self *prima Facie* to the nicest Palate, and sufficiently provides it self against disingenuous Cavillers. His *Harmonicon* in Latin, British and Irish is a Noble *Promptuarium* of all the British Dialects; a Work of much Labour and Judgment, and which cannot but be acceptable to the Curious in Foreign Countries. It were indeed to be wish'd the whole were translated into *Latin*; Scholars abroad having generally a greater Curiosity this way than as yet we seem to have in *England*. Father *Julian Manoir's* *Armoric* Grammar is a valuable Curiosity, and illustrates the Work; It having scarce been ever heard of in our Country; and the *Armoric Dictionary* added to it, supplies in a great measure the defect of the *Cornish* one promised in the next Volume. In the *Cornish Grammar* our Judicious Author seems to excel himself. You have there the History of our British Alphabets nicely and accurately handled, with a very Curious and Diverting variety of things. You have also a considerable Supplement to Dr *Davies's* Learned Dictionary. He has infinitely obliged the Ancient *Britons* of *Cornwal* by preserving their Language to Posterity, when just expiring. I cannot omit saying thus much of that Noble Dialect of the British; that it appears as capable of Artful Management and Grammar Rules, as the most refined Languages: Indeed the *Celtic* Tongues in general seem to have been very Anciently refined, and I question not the truth of what is stated in that incomparable Letter of our Author to the Lord Bishop of *Hereford*, that they were the very Ground-work of *Greek* and *Latin* Grammar; not only the *Celtibrian* or *Scottic* part of our Irish, but even the Noble *Teutonic* Dialects themselves, so Learnedly recommended by the incomparable *Erasmus* in his late *Thecaurus*, forming but derivative of compared to the Art and Variety with our British. The Learned World will therefore the more wonder at Father *Mollay* was able to perform so little in the *Grammaticus's* part

in his *Irish Grammar*. The Declensions of *Nouns* and *Pronouns* I must own to be mostly upon the *British* Plan; but the Verb, which is the Ground-work or Basis of every regular Tongue, seems, as in all uncultivated Languages, wild and unaccountable. In the *Catalogue* of *British* 1780, our Author has consulted the Reader's time, by composing it in the Order of Alphabet, with Abbreviations directing to the *Studies* where they may be seen at present; and also his advantage by distinguishing always between *Tracts* and single Papers, and between perfect Treatises and imperfect; giving a more particular account of such pieces as seem to deserve it, and dismissing the useless Poets of the two last Centuries with only the bare mentioning them. Nor has he shew'd more Industry and Judgment in this and the other Titles of this Work than has been (for the extent of it) successfully imitated by his Ingenious Fellow-Traveller Mr *Ferry* in his Excellent *Essay towards a British Etymologicon*, where he has modestly parallel'd the greatest part of the *British* Radicals with those words that seem'd agreeable therewith in any other Language; without pretending to determine the point of Precedency as to Antiquity, which has been too much the boldness of the late Learned *Monsieur Pott*, and indeed of most other Etymologists. The *Irish Focloir* or *Dictionary* so industriously compiled by our Learned Antiquary, and supply'd with a large Appendix of omitted words from *Scotland* and *Ireland*, cannot (besides the great Service it must needs contribute to the Inhabitants of those Countries) but be judged of considerable use to Criticks in the *British* and *Celtic*; The *Gnyddelian* part of that Language, being that which was spoken by the most Ancient Colony of the *Celts* in this Island, and consequently containing the Etymologies of vast Numbers of *British* Derivations and Compounds otherwise not to be accounted for.

The singular Generosity of those amongst the Nobility and Gentry who have so liberally contributed to the Expences of the Author's Travels, in order to accomplish this uncommon and Undertaking, has (as you know very well) besides their Names prefix'd to this Volume, been gratefully acknowledg'd in the Preface of a Latin Book written during his Travels. Nor can I find so innumerable as to be ever so much celebrated, there being no other Method of rendering one capable of such a Task, but those Travels through the remotest parts of *Britain* and *Ireland*, which he has upon that Encouragement so successfully performed.

One would think that in this Learned and Curious Age nothing need be urg'd as to the usefulness or preserving in Writing these Original Languages of *Britain* and *Ireland*. But yet so subject is Humane Nature to prejudice, and so apt to entertain the easie Humour of Jesting, rather than that more Thoughtful one of considering Subjects, and examining them; that I find a great many Gentlemen, otherwise very sensible and ingenious, neglect a loss herein. The use of committing to Writing these now almost Antiquated Languages is what the Author has truly hinted in his Dedication and Prefaces: Namely the tracing out of the Original Inhabitants of these parts of Europe; The Interpretation of the Names of Persons and Places in the Roman History and Geography, not only of *Gaul*, *Britain* and *Ireland*, but in a great measure also of *Italy* and *Spain*; The Improvement of such Works of Learned and deservedly Eminent Men as the Etymological Dictionaries of *Vossius* and *Menage*; the explaining such passages in the Greek and Latin Writers as relate to the Rites and Manners of the *Gauls*, *Britains*, &c. by a diligent perusal of the Ancient Poets, and such others of the Oldest Writers as are extant in these Languages. As for such as shall answer, that tho' all this should be granted, yet still these are but trifling and useless

his Dissertions, 'tis plain they speak so unlike School Divines, as not to require any further Reply.

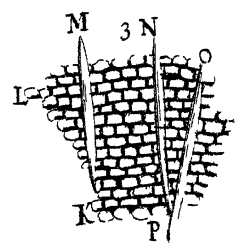
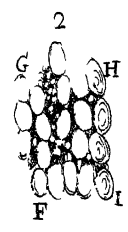
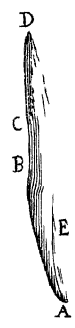
'Tis not to conclude without taking Notice of one Circumstance, has been whisper'd about by Men of Passion or In-reague, &c. That this Book is design'd to serve a certain Interest. I therefore think my self oblig'd in Justice, to certify to the Publick, that after a careful perusal of all the Parts of this Work, I cannot discern a Single Part any where that in the least tends to favour any Party, or is any way concern'd in any National Dispute; and that the Author every where discovers himself a Man of Candor and above Partiality. I have not, I confess, had the Happiness of a Personal Acquaintance with him, but I presume I may, as our Blessed Saviour directs, *Judge of a Tree by its Fruit*

L O N D O N

Printed for *Benj. Walford*, Printer to the Royal Society, at the *Prince's-Arms* in *St. Paul's Church-yard*. 1707.

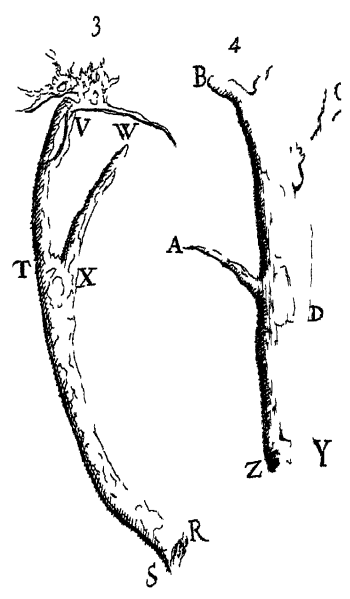
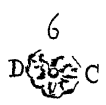
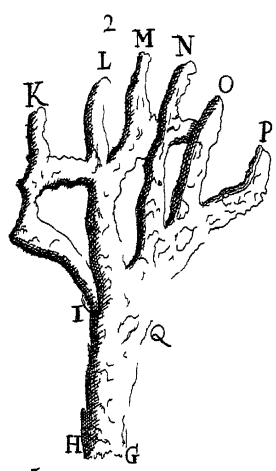
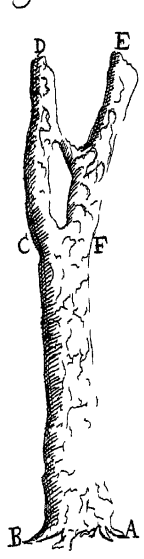
Tab 1

Fig 1



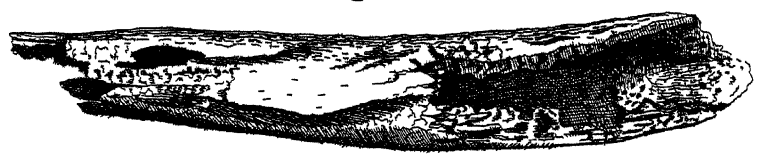
Tab 2

Fig 1



Tab. 3.

Fig 1



PHILOSOPHICAL TRANSACTIONS.

For October, November, and December, 1707.

The CONTENTS.

- I. *Microscopical Observations on the Cortex Peruvianus: By Mr. Anthony Van Leeuwenhoek, F. R. S.*
- II. *A Letter to the Royal Society, from Mr. Anthony Van Leeuwenhoek, F. R. S. Concerning the Whiteness on the Tongue in Fevers, &c.*
- III. *Part of a Letter from Dr. Scipio des-Moulins, to Dr. Hans Sloane, R. S. Secr. Concerning a Mineral Water at Can-
terbury.*
- IV. *An Account of the Cure of two Sinuous Ulcers possessing the
space of the whole Arm; with an Extraordinary Supply of a
Callus which fully answers the Os Humeri lost in cure of
Cure. From Mr. John Fawler, Surgeon to the Sick and Wound-
ed at Deal, to Dr. William Cockburn, F. R. S.*
- V. *Part of a Letter from Richard Waller Esq, S. R. S. to
Dr. Hans Sloane, R. S. Secr. Concerning two Deaf Persons,
who can speak and understand what is said to them by the Mo-
tion of the Lips.*
- VI. *A Relation of a Deaf and Dumb Person, who recover'd his
Speech and Hearing after a Violent Fever: With some other
Medicinal and Chirurgical Observations. By Mr. Martin
Martin.*
- VII. *Observatio Eclipsis Lunaræ peractæ Bostonij Nov. An-
glorum, die quinto Aprilis vespere, A. D. 1707. à Tho-
Biattle.*

I. *Microscopical Observations on the Cortex Peruvianus: By Mr. Anthony Van Leeuwenhoek, F. R. S.*

I Have been many Years acquainted with the Heer *Angelus Van Wikhuyfen*, a Doctor of Physick at *Midd'elburg* in *Zealand*, and I have a much greater esteem for him, because he has owned to me several times, (and so indeed have divers other Learned Gentlemen,) that he knew very little of the Art of Healing, and that most of his Operations were performed by simple Medicines.

When this Gentleman came to visit me last, our Discourse fell again upon the Skin or Bark of that Tree, which is called *China China*, and which is made use of with success in the most Obstinate Fevers.

Our Discourse amongst other things rolled upon this Topick, That between one Bark and another there is a great deal of difference; for in all Woods that are known to me, the Bark proceeds out of the Wood, and every Year there is produced a new Bark between the Wood and the old one of the former Year, by which means the Barks of Trees grow every Year thicker and thicker; so that at length the extreamest Bark that lies farthest from the Tree does not only receive no nourishment, but also dies, so that that which before had a taste in it becomes altogether tasteless, as I have shewn upon other Occasions; and consequently those Barks, which we call *China China*, are best when separated from the youngest Trees.

Hereupon the Doctor frankly Communicated to me, how he made use of the *China China*; adding, that he thereby

thereby infallibly cured all Fevers that were going off, and gave me leave to Publish what he told me.

He beats the *China China* to a fine Powder, and passing it through a very fine Sieve, takes two Drams of it, and infuses it into half a Pint of *French Wine*, and so gives it mingled with the said Wine to his Patient to drink; or else he takes about an Ounce or 16th part of a Pound of the said fine Powder, and puts it into a Glass Bottle, and pours upon it a Quart of *French Wine*, and so lets it stand for use: His Directions are, that about an Hour before the Fever comes upon you, you should take the Bottle and shake it well, to the end that the Powder that had subsided, may be well mingled with the Wine, which is to be divided into four Dose; and taken upon every Access of the Fever, in case it should return; and by this means, he says, hardly one in an hundred have failed of being cured.

About a Year ago, I took three or four little pieces of the Bark of the Tree called *China China*, and examined it as well as I could, but was not satisfied in my Observations; wherefore I took again a little handful of the said Bark, both of the thickest and thinnest sort, in order to examine it anew, and try whether I could have any better luck, than in my former Observations, which I laid aside, as if I had never made them.

I observed then, that the Bark called *China China* does for the most part consist of long Particles, both ends of which run into a Point, some of which, at first view, one would judge to be twice or thrice as long as the rest; but examining them more nicely, I found that they were several Particles sheathed, as it were, within one another, in such a manner, that without looking very close upon them, one would take them to be one continued Particle.

These Particles are somewhat Transparent, inclining to a yellowish Colour, and almost round.

I chose out a long Particle, which lay the length of the Wood in an Oblique Position, running along some of those that were near the Extremity or Ends of the Bark, and caused it to be drawn as you see in Fig. 1. A B C D E.

At B is represented a small Crookedness occasioned by the Vessels that proceed from the Wood, and by which the Bark receives its increase.

By C D is represented that part upon which another of the long Particles lay, and so made a Dent or Indentation therein, and the same also happened to the other end of it, described by A E, occasioned by another Particle that lay under it; but I never observed any thing like this in other Barks of Trees that I have examined, save only in that which is called Cinnamon.

I placed moreover before the Eyes of the Painter some of the said long Particles, after I had cut them asunder Horizontally, and caused him to draw a small Number of them, that you may judge how close the said Particles lay by one another in the Bark; yea, I have seen six of them lie so near one another, that you could but just distinguish the Number of them; and that which divides these long Particles from each other, is only the Vessels that compose part of the Bark, and proceed from the Wood, as I often said before, and from whence also I conclude, that the above mentioned Particles receive their increase.

Fig. 2. F G H I, represents an exceeding small part of the abovementioned Particles, so as they are cut across, whereby they appear in an Oval Figure; and if we view them very nicely we may discover, that they are composed of Screw like Parts, as you may see in four of them between I and H.

From this Observation I supposed, that they were not at first made in an instant of time, but that they gradually receive their Increase.

I have several times cut the Bark *China China* through perpendicularly, or length ways, in order to discover the Vessels that receive the said long Particles, and by which they are nourished ; but I could never succeed, by reason of the vast Number of the long Particles, which caus'd the small Vessels to Break in pieces.

I steep'd some of the said Bark of *China China* in Rain Water, in order to soften it, for the outside of it is so hard that it could not be cut otherwise ; however it remained still so hard, that I could not make use of it to my Satisfaction ; but I have nevertheless observed several times, that the extreame part of the Bark had no such long Particles as are described by *Fig. 1.* from whence I judg'd, that the said Parts were dead or perished, as is usual in several other Barks.

When I had separated the outmost part of the Bark from the rest, I discovered, that the Vessels which mostly compose the said Bark. did not run length-ways, but Horizontally in the Bark ; and whereas in the Bark of many Trees I could discover the Yearly increase in growing thickness, I could never but once discover the same in the *China China* ; at which time I observed, that the Vessels that lie Horizontally therein, (and are no bigger than the Hairs of ones Head,) were so close to one another, that there was not one of these long Particles described by *Fig. 1.* lying between them.

Now as the extreame part of the *China China* is almost always rough and very hard, I took one of the little Barks, whose outside was smooth like others tho it was not of a thicker Wood, and after I had steep'd it about 24 hours in Brandy, I found it much softer in the Cutting, than all the others I had dealt with before ; by this Bark I judg'd that it had been increasing six Years in thickness, before the long Particles represented by *Fig. 1.* were made ; and thus with much less labour I could clearly discover, that the accession or increase of six Years

thickness in the Bark, consisted in nothing else than of Vessels which were disposed Horizontally in the said Bark ; and entring a little further into the Bark, I found but very few of the above mentioned long Particles, but the further I came, the thicker they lay, till at last I found 'em as numerous as in other Barks : And whereas all other Barks of the *China China* are so heavy that they sink in Water or Brandy, this Bark which was smooth, swam, and tho' I thrust it under the Brandy yet it would emerge frequently.

Whether the *China China* be of two sorts of Trees is not now the Subject of my Enquiry, but in the mean time I judge by those pieces of Bark which I had, that they are for the most part taken from the extream part of the Bark, which is in a manner perisht, for want of enjoying any longer its nourishment from the Tree; and since as I told you before, that smooth Bark which I had steeped some days in Brandy, would not subside, but floated therein almost equal with the Superficies, one would be apt to conclude, that the heaviness of the Bark depended on the Multiplicity of those long Particles described by *Fig. 1.*

Now that you may have a true Idea of the above mentioned Vessels, I caused a small part of them to be drawn, as in *Fig. 3.* K L O P, which Vessels so described, lay very near the Extremitie or outside of the Bark, and in which the Painter could discover but three long Particles K M, P N and P O.

Several Persons seeing these kind of Figures would be inclin'd to think that they were not Vessels, being unable to conceive how the Saps can be carried thro' such Oval Particles which seem to be shut up quite round ; but if they considered, that in divers Plants, and in some Woods there are found a sort of Covers to their Vessels, which are as *Valvula*, and serve to hinder the pro-

truded

truded Sap from returning the same way, they would not think it so strange an Appearance.

The Microscope, which I made use of to represent this last Figure, does not magnify near so much as that made use of for the former.

In all my Dissections of the Vessels I could not once discover that any of the before mentioned Particles were joyned to those Vessels, and therefore I imagined, or rather considered, whether those long Particles might not be Coagulated Salts.

After that I had steeped a little piece of *China China* about 24 hours in Brandy, I observed several small Particles thereof floating, but I could not discover, that any of the long Particles were lessened or gone over to the Brandy.

I did several times lay a drop of the Brandy (wherein the *China China* had been steeped) upon the cleanest Glass I could get, in order, if possible, to discover whether any of the Salts of the *China China* might be gone over to the Brandy; and every time I discovered with great Amazement, that within the space of 12 Pulses, the fluid matter, (which was otherwise very clear, saving that it inclined to a Russet Colour) where it lay thinnest, was turned into a white Substance, and soon after the same happened to other drops that were thicker. And when I viewed this white Matter with my Microscope, I discovered an unconceivably vast Number of small Particles, insomuch that no Man would believe it unless he saw them, and where these Particles lay thickest together, they appeared to be of a Russet Colour.

I several times laid as much of it upon a clean Glass, as would make the Quantity of a Grain of Sand, to see if it were possible the Figure of those Coagulating Particles, but they were so unconceivably small, that they escaped my sight; and as soon as I had set this fluid Matter in the

Air, and placed it before my sight, I perceived the Particles moving amongst each other ; they were also in vast Numbers, and the Moisture being dried up, they assumed a White Colour.

Afterwards I infused some of this Bark in a well tasted Florence Wine, in which after it had lain about 24 Hours, I took a drop of the said Wine, and put it upon a clean Glass, and observed therein likewise abundance of Coagulated small Particles, but nothing near so numerous as those that appeared in the Brandy ; I could also perceive some Salt Particles in the said Wine, but when I put in some more of the *China China*, the Coagulating Particles increased, but none of the Salts which are peculiar to the Wine did then Coagulate.

I infused again a little of the Bark in Rain Water, and after a little time poured some of it upon a clean Glass, in order to its evaporating, and then observed, that a great part of it was turn'd into a Scum, but there was nothing more remarkable in it.

Moreover I took a strong Pickle, and put some of it into a Glass Tube of the thickness of a small Birds Quill, and conveyed into the Middle of that Pickle, in three distinct places, a little of the Brandy in which the *China China* had lain three or four days ; and I observed, that the Brandy would not mingle with the Pickle, but immediately coagulated like Clouds, which Cloudy Matter, as being lighter than the Pickle, rise up to the upper parts of the Glass ; and tho' this Coagulated Brandy, in which the *China China* was infused, had been ten days in the Pickle, yet was it not dissolved ; and whereas the Coagulated parts, by reason of their lightness, had at first emerged, they did afterwards sink down gradually to the bottom, and tho' by shaking I moved them upwards, yet when the Glass stood still they would presently subside.

Afterwards

Afterwards I took some Pickle and mixt it with Brandy in which the Bark had lain about eight days, and poured some off upon two distinct Glasses, and then observed that as soon as the said Brandy was mix'd with the Pickle, the mingled Stuff assum'd a whitish Colour; and when I viewed it with my Microscope, I discovered therein so many Coagulated Particles, even where the Liquid Matter had run off of the Glass, that it was hardly to be conceived how there could proceed, out of two transparent mixed Liquors, so many Particles, which through the Microscope assum'd of the Colour of the Bark *China China* besides an innumerable number of such exceeding small Particles, that they almost escap'd my sight, tho' viewed through one of the best Microscopes; and about the space of a Minute after, in the place where the Liquid Matter had lain thinnest, I saw a great many Coagulated Salts of Quadrilateral Figures, the sides of which run obliquely into a Point, in appearance like a Quadrilateral pointed Diamond; others were Coagulated without any Shape or Order and all encompass'd with small Particles mentioned before: I saw moreover, a great many very transparent irregular Particles coagulated, of which, in all my Observations upon the Pickles and Brandy, I had never seen so many and so large; in viewing those Particles more narrowly, I found they were Salts that had not been able to Coagulate.

After this I took a little Brandy (about the Quantity of three or four Grains of Sand) in which some of the *China China* had been infused, but not in whole Pieces; and I mix'd the same with about a like Quantity of my Blood, which by the prick of a Needle I had drawn out of my Finger, and as quick as ever I cou'd placed it before my Microscope; and then with great Amazement observed the Operation of this mingled Stuff, in which there was such a fermenting and running about of the Parts, that it is impossible for me to express it to you;
and

and in these Commotions I observed, that most of the Globules of the Blood (which are the occasion of its redness) were dissolved, and I judged that this fermentation lasted about a quarter of a Minute; and because it was very diverting, I repeated the Experiment several times.

Moreover I mixed my Blood with some *French Wine* in which the Bark had been infused, but discover'd no such fermentation as I had observed before, but I could perceive in some few places the Globules of Blood Coagulated after such a manner, that it appeared like a very thin Membrane torn to pieces, and several very thin Fibres or Threads thereof lay about, such as I had never seen before; and I think I never saw so little Coagulation of the Globules of Blood when mingled with any Liquid as I perceived with this mixture, but when the Blood was dry, and where it had lain pretty thick, there it was so much Coagulated, that there could be no Globules any longer observed therein.

Now if we consider that our Stomachs deliver out such Juices as Coagulate the Common Salts which are in our Meat and Drink, and discharge them with the Excrements, 'tis possible that many more parts of the *China China* are dissolved in the Stomach, and such a Coagulation caused in the Chyle, that the Juices which go into our Bodies, have such an Affinity with the Serum of the Blood, as to hinder its Separation, and so keeps the Blood in such a Fluid state, that the Distemper which we call a Fever is thereby prevented.

You will pardon me for trespassing so far beyond the Bounds of my foregoing Observations, but we cannot but stand amazed when we see that a Codfish should have two, three, or four Haddocks in its Stomach, which according to the manner of all Fishes, they swallow down with the Head foremost, and which serve for their Food and Nourishment; and that not only the Flesh of those
Fishes,

Fishes, but also all the Bones of the Heads and Bodies, are so broken and dissolved, as to be turned all into Chyle, excepting those Parts that are discharged with the Excrements.

Now one cannot conceive, that the Bones of these Fishes should be dissolved by the Motion which the Stomach receives from the *Ledens gewyse* Parts, which are on the Head, and which we call Cheeks; but one must imagine, that there is a Juice in the Stomach of Fishes, that causes the Dissolution of the Bones; and if it be so in Fishes, why not likewise in Four-footed Beasts, and also in Birds.

Whilst I was writing this, my People were preparing two Turbots for my Dinner, the biggest of which was above a Foot long, and had in his Stomach a young Whiting (not yet consumed,) and which being longer than the Stomach it self, part of the Tail was turned up to the Head, the most part of which was Dissolved and Consumed, but the Body was as fresh and good as any that are brought into the Market.

Having made these Remarks, and entred them into my Book, I writ the following to the *Heer Van Vliet*.

I think I have heard speak some Years ago of the China Chinæ, and been informed that this Medicine is not to be used but with the utmost Caution, for that otherwise it may be so prejudicial to the Body, that tho the Fever should be removed, the subsequent Inconveniences may be worse than the Disease it self; Wherefore you having had so much Experience of the China Chinæ, you cannot but know whether that Medicine does leave any Distemper behind it; of the truth of which I would gladly be informed.

Whereupon the said Gentleman answered me from Middelburg, July 15, as follows.

I know that many are of that Opinion, but what Grounds they have for it I can't tell; I must declare, that nothing of that has occurred in my Practice, and I have used as much of the Bark as any Body.

II. *A Letter to the Royal Society, from Mr. Anthony Van Leeuwenhoek, F. R. S. Concerning the Whiteness on the Tongue in Fevers, &c.*

Delft, Octob. 18. 1707.

I Have been long of Opinion, that our Tongue is of such a Form, that when it is sound and of good Condition, it does not only communicate to the Body whatever is agreeable to it self, but also admits one part of the Matter that lies upon it, into the Manifold Vessels of which it is composed; inasmuch that by the Veins it's communicated to the Heart, and serves for Nourishment to the Body, and strengthening of a well Constituted Tongue.

It so happened, that in the beginning of last September I was seized by a violent Fever, which however lasted but three days with me; upon the Fourth day I viewed my Tongue with a Magnifying Looking-Glass, and observed, that it was all over covered with Whiteness, only about a Fingers Breadth of the Tip was of its Natural Colour; this Whiteness is judged by most People to proceed out of the Stomach or Bowels, by the Swelling of the Guts, or else from a sharp Humour out of the Head.

Perceiving my Tongue thus all over White, I scraped off a little with a Penknife, and placed it before a Microscope, and presently judged, that those that call this White Matter in our Language *Beſlagenthooft*, and so publish it in their Books, are much mistaken, for that which truly bears that Name must be something from without, and not any Matter protruded from the Body.

Now

Now that this above-mention'd White Matter has no Analogy or Agreement with that which is coagulated upon the Tongue from without, but that it is certainly protruded out of the Tongue, appear'd to me very plainly; when I view'd it with my Microscope, for I could then observe, that it was not only closely united to the Tongue, but that it was also forced out of it, just as Plants proceed from the Earth; yea, that it extended it self into Boughs and Branches.

Now for the better understanding of the said protruded Matter from the Tongue, I plac'd some of it before a Microscope, and caus'd it to be painted, after having separated the Parts from one another, which I often found clung together.

Tab. 2. Fig. 1. A B C D E F represents one of the said small Parts which I had scraped from my Tongue; A B shews where it was fastned to my Tongue, and C F shews how the Body of it divided it self into two Branches, described by C D and F E.

I have observed several times in the afore-said Trunk or Body of that Particle a long Fibre or Streak running perpendicularly thro' the middle of it, which I imagined to be a sort of a Vein or Vessel from which the whole Body or Branches received their Nourishment; but as soon as that White Matter becomes dry, one sees no more of those Fibres in it.

Fig. 2. G H I K L M N O P Q represents a second Particle, which I had taken from my Tongue, of which G H I Q is the Stalk or Root, and K L M N O P the six several Branches, all which were at G H united to, or rather riveted in the Tongue.

Fig. 3. R S T V W X was a third Particle protruded out of my Tongue, and at T X you see the place where it divided it self into two Branches, which Branches are divided by T V and X W; and the Painter having observed at V some further sproutings out, he has described

them according as they appeared to him, but I my self have observed such out Sproutings as look'd like Flowers ; and whereas my Fever had left me about a day or two before I scraped off that White Matter from my Tongue, I imagined that the extream parts of the aforesaid Matter were almost worn or rubbed off when I made that Observation.

Fig. 4. Y Z A B C D was a fourth Particle of the protruded Matter from my Tongue, of which the greater part of the Branches were, in a manner, worn or broken off, as you may see by A B C.

There was so much to be observed in all these Particles which I had scraped from my Tongue, that it was impossible for any Painter to describe them ; they seem'd outwardly to be Convex, and withal as transparent as Chrystal ; that is to say, at the very time I took them from my Tongue and view'd them with a Microscope ; but when they were dry they did not appear so neat, which was occasion'd by the Slimy or Glutinous Matter which we have always in our Mouths, and which makes these Particles cleave together.

That I might free them from the aforesaid Glutinous Matter or Spittle, I put them into a little Rain Water, and stir'd it gently about, to the end that the said Matter might be diluted and united to the Water ; this being done I took some of those Particles, which by their weight had subsided to the bottom, and placed them before a Microscope.

I observed also with Wonder, how very strongly they were fastned to my Tongue when I scraped them from it, and that tho' I had let them lie eight days in Water, they were as strong as when they were first taken off.

Now how can we conceive the Common Opinion of some Doctors and Chymists, who maintain, that this Whiteness upon the Tongue is occasioned by the ascend-

ing Vapours and Fumes from the Stomach ; whereas, as I imagine, that part of the Stomach which receives the Viſuals is always ſhut, except when it diſcharges it ſelf of Wind, which comes out by the Throat ; and how can the Fumes come out of the Head and deſcend upon the Tongue, as they alſo maintain, juſt as if our Heads were of the ſhape and make of the Helm or Head of a Still.

Might we not better reſolve it thus ; That our Tongues are ſo conſtituted, as to receive a few of thoſe Juices into the Orifices of its Veſſels, and that this cauſes the Senſation which we call Taſte, and that theſe Juices are carried or preſſ'd by the little Coats or Tunica's of the ſmall Veins that are in the Tongue, and ſo continued by the great Vein to the Heart ; but when we're indiſpoſed with a Fever, the Whitenefs which at that time appears upon the Tongue is occaſion'd by the Blood being ſo thick, that it can't be carry'd (as it ought to be) thro' the ſmall Veſſels, and by the Expulſion or driving back of that Moiſture in the Blood, which we call *Serum*.

Now the Tongue being thus cover'd with that White Matter that is protruded out of its Veſſels, is incapable of admitting any of its Juices into it, and this is the reaſon that at ſuch times we have little or no Taſte.

Moreover there lay about that Matter which has been deſcribed by *Fig. 1, 2, 3, 4*, a vaſt Number of little Scales, with which our Mouth is all cover'd over within ; and the Painter having obſerved two ſuch Scales that lay partly upon one another, he drew them, as you may ſee in *Fig. 5*, between A and B, and below them here lay another ſingle Scale, which is deſcribed by *Fig. 6 C D*.

Now ſince we obſerve ſo many of theſe little Scales to fall off of their own accord from the Mouth, may we not well conclude, that in a ſtrong Fever, ſuch Scales receive Nouriſhment.

We also observed, that a great many of these Scales had a round Bubble in the middle of them, and that there was seldom in one Scale two Bubbles, as in *Fig. 5.* in that Scale which is represented by B ; I thought with my self, whether this might not be the place from whence the Scales received their Nourishment.

Fig. 6. Does likewise represent a Scale between C and D with a round Bubble in it. You may remember I told you above, that I could observe none of this White Matter upon the Tip of my Tongue ; the Cause of which, perhaps was the great heat of the Liquor I then made use of ; for as soon as I found my self in a Fever, I ordered some Coffee to be made for me, and drank four Dishes of it as fast as I could one after the other, inso-much that my Lips were very sore with the heat of it the day after ; the drinking of this Coffee gave me great ease, and the next Morning I drank some *Bohea Tea*, as fast as ever I could, in order to put my self into a Sweat, but in vain ; now 'tis possible that the heat of the Coffee and the Tea had dissolved, or loosened the White Stuff upon the Tip of my Tongue, which is to be enquired into.

I have said before, that upon the fourth day of my Fever I first viewed my Tongue and the White Matter I scraped from it, which was the same Day my Fever left me ; and I imagine that about that time a great deal of the White Matter, that had been about my Tongue, was fallen off, and that had I viewed the same the second Day of my Fever, I should have seen that Matter and the Branches of it much more plainly.

In the Month of *October*, it was reported in my House, that there was a young Man so grievously troubled with the *Thrush*, that they were afraid it would have killed him, for he could scarcely draw his Breath ; having inform'd my self who was his Doctor, I sent to him and desired him to let me have a little of that Stuff which was taken from the Tongue of the Patient, which accordingly

condingly was brought to me two Days after one another.

This Matter, which lay upon a Paper, stuck so fast together, that it was very difficult to separate it, and the most part of it appeared as clear as any Water to our naked Eye ; having view'd it thro' a Microscope, I saw that the clear sticking Moisture was encompass'd with an exceeding great number of very small Globules, which appeared to me to be much smaller than those that make our Blood Red ; and when this White Matter was thorough dry, it appeared to be of a Green Colour, much like that Matter which we discharge by the Mouth when we catch cold, and which is commonly call'd Green Phlegm.

The Doctor told me, that a Day or two before, there peeled off whole Skins from the Tongue of his Patient, whereupon I asked him, Whether his Tongue was not very much swell'd ? To which he answered, It fill'd the whole Mouth.

I observed moreover in the said Matter, when I view'd it wet or dry, such a great number of small Fibres, just as if it had been a thin Membrane that I had placed before the Glass.

I said to the Doctor, how much those Persons were mistaken that affirm that these Skins upon the Tongues proceed from the Vapours or Fumes of the Stomach, in which the Doctor agreed with me ; but when I told him that the great thickness of the Tongue was occasioned by the want of the Blood circulating therein, whilst the Heart was continually sending up fresh Blood into the Tongue, by which means it was forc'd thro' the Tunics of the Vessels, and turn'd to that Matter which was found upon the Tongue, and which we call the Truss ; and whereas that Matter which I found in my Ulcers upon my Tongue was nothing but the *Serum* of the Blood, the reason of that was, That the Protrusion of the Blood was not so strong

strong in me, as it was in the Young Man, neither were there any Globules to be observed in it; I say when I told the Doctor this, he seemed to differ from me at first, but afterwards he agreed with me entirely in this Opinion; to wit, that the Matter, which was found upon the Tongue, does not proceed from Fumes and Vapours out of the Stomach, but is protruded out of the Tongue; and added moreover, that when he scraped such like Matter from the Tongues of his Patients, in half an Hours time they were covered again with the Matter which we call the *Thrush*; and further, that when the Patient being something better had scraped off the Matter upon the Tip of the Tongue somewhat too harshly, he caused his Tongue to bleed, but soon after it had done Bleeding, 'twas again covered with the *Thrush*.

III. *Part of a Letter from Dr. Scipio des-Moulins, to Dr. Hans Sloane, R. S. Secr. concerning a Mineral Water at Canterbury.*

ABout twelve Years ago a Mineral Water was accidentally detected in this City. In digging the Ground, they first met with a fat black Mold extending it self three Foot deep, and gradually changing into another sort of Earth, very fat and like Butter. This second Lay was two Foot thick; the Colour of it Yellow something mixt; it's Odour strong and Mineral; and a piece of it, being for some time expos'd to the Sun, smell'd much like burning Sulphur. After this they found a Quicksand of a darker Colour than the first Earth, mix'd with several little Stones, and the Smell still stronger than before. Two
Foot

Foot further, under the Quicksand, a hard Rock appear'd, out of which Water gush'd with some Violence. They dug two Wells at about 7 Feet distance from each other; one about eight or nine Feet deep from its Surface, and twelve from the Surface of the Ground about it, and reacheth the Rock: T'other is not so deep by two Foot, and only toucheth the Sand. This last is something stronger of the Sulphur, but the other is stronger of the Mineral Spirit and ferruginous parts.

Two Drams of the second Lay of Earth, found in digging, being put into four Ounces of Spirit of Vinegar, there presently arose a considerable Ebullition; and soon after the Spirit was ting'd with a yellow brownish Colour, which suffer'd no alteration with the Infusion of Logwood, nor with Galls, but with Oyl of *Tart. p. delic.* turn'd greenish, and with the Infusion of *Lig. neph.* of a pale red.

The Water taken up at the Spring is extraordinary limpid, but grows something whitish in a quarter of an Hour, and in half an Hour the Spirit is lost and the Mineral hangs first on the sides of the Glass, and then falls gradually to the Bottom. It won't keep quite so well as the *Spain* or *Tunbridge* Water. Its Taste is masculine and austere; the Smell ferruginous and strong, something upon the Sulphur: People say it smells like Gunpowder. It will make the Root of the Tongue of the Drinkers look blackish. Linnen wash'd in it turns yellow. It will not lather with Soap. The Glasses the Water is dipp'd with grow yellow, which no scowering can take off, and are apt to fly. In frosty and cold Weather, it is so warm as to melt Ice and Snow; in other Seasons it's cold, though not so cold as some Spring Waters are.

The weight of this Water varies much according to the Seasons and Weather. In *May* 1704, it weigh'd three Grains lighter than Common Water in the quantity of a Pound. In the Spring of 1705, it was equal in weight

Common Water ; and is now still heavier in *August* following, because of the exceeding dry Weather of that Summer. But in general about Midsummer, if the Weather is no ways extraordinary, it's pretty equal to common Water in weight.

A single Grain weight of good Gall will turn a Pint and a half of this Water of a very noble deep red, and in an instant. Syrup of Violets turns it of a Grass green. With the Infusion of Brasile it giveth a deep lively Blue : With that of *Lign. neph.* first a light Green, then a light Yellow, with a Blue Crown : With the Infusion of Logwood, a blue Black : With that of Fustick Wood, a dusky Yellow : With the Flowers of Pomgranates, a fair Violet : With Leaves of Thea, a fine purplish Blue : With good *Nants* Brandy, an Elegant Sky-colour. It turns a Solution of the *Sacch. Saturn.* Milky in an Instant ; and the Solution of Sublimate in some time longer. *Ol. tart. per deliq. sp. Sal. Armon. sp. Vit. &c.* make no sensible alteration.

In Calm Weather, in Winter especially, a thick oily Film covers the surface of these Waters, of as great a variety of Colours as a Rainbow ; a Spoonful of it drunk, hath the effect of, and composeth as much to Sleep, as a moderate Dose of Opium. Some of this Scum, being dried by Evaporation, tasted very fat, and felt so between the Fingers. Some of this Powder being cast upon a red-hot Iron, most of it immediately burn'd away with some sparkling ; and what remain'd was of the Colour of Rust of Iron, and tasted partly Stiptick and Earthy, and partly Salty.

The Water it self, being gently evaporated, yields a Yellowish Sediment, more or less, according to the Seasons. Last Spring a Quart yielded six Grains of it ; but in *September* following, the same Quantity afforded me nine Grains ; whereas a Pound of *Tunbridge* Water gave but one single Grain of Sediment to Mr. *Boyle*, as appears

by his *Manners of Mineral Waters*. This Sediment being boil'd in common Water, made a strong *Lixivium*, with which Acids caus'd no sensible Fermentation; but Syrup of Violets turn'd it Green. This *Lixivium* being evaporated, yielded a fat Sulphurous Salt, that would not coagulate into Crystals. I can get but three or four Grains of it out of ten Grains of Sediment; but from the Colour and Taste of the *Lixivium*, I have reason to suspect, that there is a larger proportion of Saline Particles, which, as I conceive, being Volatile, evaporate away with the Water. These are some of the most material Experiments I have made upon these Waters.

As for their Medicinal Virtues, I might say a great deal, but hoping to enlarge upon it another time, I shall only tell you, Sir, that from the many and truly wonderful Cures, I believe it to be one of the most excellent Waters of this kind, as yet found out in *England*. The little Well is very useful in Diseases of the Breast, as in *Asthma's*, Coughs, Rheums and Catarhs. It hath cured several given over of Consumptions of the Lungs. Most Disorders of the Stomach are cured by this Water. It seldom fails in the Cure of Rheumatick gouty Pains of the Limbs, or other Parts of the Body, in the Scurvy and Melancholy Distempers, Jaundice, Vapours, all sorts of Stoppages, Scabs, Itch, &c. But in Gravel, Cholick, and Greensickness, 'tis a true Specifick, as also in inward Ulcers, if not too far gone. A Potter of *Bolton*, who had spent his Substance in Doctors, and was last Spring discharged out of *St. Thomas's Hospital*, as an Incurable Person, hath been cured of his U'cer in the Bladder this Summer, with drinking of this Water for three Months together.

In Agues it is beyond the Bark: I have seen some Rebellious ones, that could not be removed by the Bark, perfectly cured by this Water, and some Constitutions quite worn out by the frequent Relapses of this Distemper, re-

lured again. This is also remarkable, that it agrees best with old, decay'd, and weak Constitutions. The Water sets pleasantly upon the Stomach, works off by Urine very briskly, causeth a good Appetite, cheers the Spirits, and procures Sleep. It is not binding, as some other Chalybeats are, but keeps the Body open to most People, and upon some it brings now and then a gentle Looseness, which carries off the Distemper. For these four Years I have prescrib'd 'em to many Scores of People every Season, and I could never observe any inconvenience, or ill Symptom arise from the Drinking of 'em.

IV. *An Account of the Cure of two Sinuous Ulcers possessing the space of the whole Arm, with an Extraordinary Supply of a Callus which fully answers the Purposes of the Os Humeri lost in time of Cure. From Mr. John Fawler, Surgeon to the Sick and Wounded at Deal, to Dr. William Cockburn, F. R. S.*

S I R,

YOU perswade me that it will be very acceptable to the Royal Society, to give them some Account of that troublesome Cure I spoke of to you, whereby these diligent Naturalists may be likewise furnish'd with an uncommon instance of the Power, as well as the Bounty of Nature, in providing against the loss of the Bone of the Arm with a Wonderful *Callus*.

The Case was of *John Marsh*, of the Parish of *Denon* in the County of *Kent*; he was about 16 Years Old. This young Man was troubled with a Tumour on his Arm
in

in the end of a continual Fever, which seem'd to be a Critical Discharge of the Humour of the Fever on his Arm. He was mara'd by a Surgeon of that Parish two Years together for this Tumour; at length, there being no appearance of a Cure, he was sent to me. At first of all, I found two Sinuous Ulcers in his Right Arm, one upwards about the *Deltoidæ Muscle*, and the other on the under part of his Arm, within an Inch and a half of the Juncture of the *Cubitus*; the *Sinus* above passing upwards within an Inch and a half of the Juncture, and downwards to the *Cubitus*. The *Sinus* of the lower part pass'd downwards to the *Cubitus*, and upward's about an Inch and a half. When both these *Sinus* were laid open, the Bone soon show'd it self carious and loose, so that I easily took it out, and was about five Inches long. [See *Tab. 3. Fig. 1.*]

Three Weeks after there came off another Spelt of Bone of the inner side, about two Inches long, having the Channel of the Marrow. [Fig. 2.] These Ulcers, with much Care and Diligence, as every one skillful in such Cases must be sensible, were Cur'd very well in nine Months; and the place of the Bone is so well supplied with a strong *Callus*, that he is not only very strong, but can lift 50*l.* weight with that Arm.

V. Part of a Letter from Richard Waller, Esq;
S. R. S. to Dr. Henry Sloane, R. S. Secr. Con-
cerning two Deaf Persons, who can speak and un-
derstand what is said to them by the Motion of the
Lips.

THERE live now, and have from their Birth in our
Town, a Man and his Sister, each about 50 Years
Old, neither of which have the least sense of Hearing;
they both live by their daily Labour, yet both these
Persons know by the motion of the Lips only, whatever
is said to them, and will answer pertinently to the Que-
stion propos'd to them of any thing within their Capa-
city, and are both very intelligent, as far as can be ex-
pected from their Education. I remember several Years
since, Mr. Colson the Mathematical Master, coming to see
me, this Man was then working in the Garden; and
Mr. Colson and I standing close together, I took an op-
portunity when the Fellow look'd on me, to ask him
some Question or other, which he readily understood,
and answer'd according to it; tho' Mr. Colson that stood
by me heard me say nothing, the Fellow understanding
it only by the motion of the Mouth, so that you need
only Whisper, provided the Lips and Mouth be but moved
as they ought, and you do not speak too fast. I many
Years since inquired of his Mother, who has been long
since dead, as to their Deafness; and she told me, they
could Hear very well and Speak when they were Chil-
dren, but both lost that Sense afterwards, which makes
them retain their Speech: Tho' that, to Persons not used

to them, is a little uncouth and odd, but intelligible enough. especially the Mans. They were not Twins; and I knew three Brothers of the same Parents, that had clear Hearing as well as any Persons whatever.

VI. *A Relation of a Deaf and Dumb Person, who recover'd his Speech and Hearing after a Violent Fever: With some other Medicinal and Chirurgical Observations.. By Mr. Martin Martin.*

Angel Frazer, a Native of *Strabarrig*, some six Miles from *Inverness*, continued Deaf and Dumb from his Birth, till the fourteenth Year of his Age. The Countess of *Caithness* kept him in her Family for the space of eight or nine Years: After Seventeen Years he was taken ill of a violent Fever, but by letting blood his Fever abated, and ran out its Natural Course: About five or six Months after, he contracted a Fever again, and had no Blood drawn from him, and this went on with its Natural Course. Some Weeks after his recovery he perceived a motion in his Brain, which was very uneasy to him, and afterwards he began to Hear, and in process of time to understand Speech: this naturally dispos'd him to imitate others, and attempt to speak. The Servants were much amaz'd to hear him, and he ran away; he was not understood distinctly for the space of some Weeks; he is understood now tolerably well, tho he yet retains the *Highland* Accent, as *Highlanders* do who are advanc'd to his Years before they learn the *English* Tongue: he can speak no *Irish*, for it was in the *Lowlands* of *Scotland* that he first heard and spoke. He continues

to serve the Earl of *Crawford*. I left him at *Morpeth* the beginning of this Month of *August*, 1707.

When the Small-Pox is Epidemical in the Main Land or against *Skye Isle* on the S. E. and East, and likewise in *Skye Isle*, the Natives Bathe their Children in the Infusion of *Juniper Wood*, and they generally escape; whereas those who neglect this Precaution, are observed even to die: Of this I have seen several Instances.

The Plant *Water-lilly* being apply'd to the pain'd part of the Body where a *Felon* is fix'd, it is observed, that it forces its Passage quickly in that place through the Skin.

The red hot Iron is commonly used in piercing an Inch deep in Arms or Legs, and cures several Distempers.

A Wound or Scarification cross the Crown of the Head cures Fluxes and Dysenteries. The Blood being stanch'd, the Wound is cured as other Wounds commonly are.

Silverweed is used as *Hops* to brew Beer.

VII. *Observatio Eclipsis Lunaris peracta Bostonij Nov.
Anglorum, die quinto Aprilis vespere, A. D. 1707.
a Tho. Bractley.*

Immerfiones.	Tempus ex Alt. correct.		
	H.	'	"
P Enumbra valde notabilis	5	52	
Palus Maræotis tegitur	5	53	20
M. Porphyrites incipit	7	8	15
Tegitur	7	9	20
M. Ætna incipit	7	16	
Penitus tectus	7	17	15
M. Sinai incipit	7	21	40
Plene tectus	7	22	40
Insula Corfica tegitur	7	24	
Lacus niger major tegitur	7	31	40
Insula Bosbicus.	7	33	
Bizantium	7	36	30
M. Horminius	7	37	20
M. Apollonii	7	40	30
M. Hercules	7	44	20
M. Corax	7	51	1
Palus Mæotis incipit	7	52	45
Insul. Maj. in M. Caspio incipit	7	54	45
Tegitur	7	56	
Palus Mæotis omnino tegitur	7	57	30
Luna plena immersa	8	1	15

Immerfiones.

Emerfiones.		Tempus ex Alt. correct. H. ' "		
Comp. Alt. Arcturi	53° 34'	8	28	
	51 30 ¹ / ₂	8	39	15
Comp. Alt. stellæ quæ fequitur lucidum?				
in corona feptentrionali				
Lat. 44° 33'	60° 2'	9	0	30
	56 57	9	17	15
Luna Emergere planè incipit		9	46	30
M. Ætna tota illustrata		10	9	30
M. Sinai tota apparet		10	10	15
Infula Besbicus		10	25	
Bizantium		10	28	30
M. Apollonii		10	33	
M. Hercules		10	36	30
Palus Mæotis incipit		10	44	
Infula Major in M. Cafpio reftauratur		10	47	
Palus Mæotis tota refta		10	49	
Luna plenè illuminatur		10	54	

A N
I N D E X
T O
The Twentyfifth Volume
O F
Philosophical Transactions.

A:

AIR, its Pressure and Elasticity. See *Experiments*.
Aged People. No. 310. p. 2418. *John Bayles Aged*
130 Years. No. 306. p. 2247.
Anatomical Observations. A Large Tumour in the Neck,
containing a Bony Substance. No. 305. p. 2214. Stony
Bodies in the *Prostates* of an Old Man. No. 305. p. 2217.
The *Uterus* Schirrous. No. 305. p. 2218. Operation
of Cutting a Child out of the Womb. No. 307. p. 2301.
Hydatides inclosed with a Stony Crust in the Kidney
of a Sheep. No. 307. p. 2304. *Hydatides* in a Tumour
of the Neck. No. 308. p. 2344. A *Hydrops Ovarij*.
No. 308. p. 2317. Balls of *Hair* taken from the *Ute-*

The INDEX.

- rus* and *Ovaria*. No. 309. p. 2387. *Sinuous Ulcers* in the Arm. No. 312. p. 2466. Some things observable in the Anatomy of the Ear. No. 311. p. 2415. See further in *Dissections*.
- Animals*. *Quadrupeds* in the *Philippine Islands*. No. 305. p. 2197. at the *Cape of Good Hope*. No. 311. p. 2428. The *Pediculus Cæti* described. No. 308. p. 2314. *Animals* dissected. See *Dissections*.
- Antiquities*. A *British* Fortification. No. 310. p. 2420. *Roman* Inscriptions found at *York*. No. 305. p. 2194. *Roman* Sudatory at *Wroxeter* in *Shropshire*. No. 306. p. 2226. Antiquity of *Wroxeter*. No. 306. p. 2230. Remarks on the *Hypocausta* of the Ancients. No. 306. p. 2132.
- Atmosphere* round the Moon. N. 306. p. 2241, 2244.

B.

- Baths* in the *Philippine Islands*. No. 311. p. 2408. *St George's Bath* by *Landeck* near *Silesia*. No. 308. p. 2346.
- Books*. See the end of this *Index*.
- British* Fortification. See *Antiquities*.

Monstrous Calf. See *Monsters*.

A *Callus* supplying the place of the *Os humeri*. No. 312. p. 2466.

Cards, their Antiquity, and that they gave the first Hint for Printing. No. 310. p. 2397.

Cape of Good Hope described. N. 310. p. 2423.

China China. See *Jesuit's Bark*.

Rock Chrystal, the Figure of its Parts. No. 311. p. 2428.

Chrystalline Particles of Silver. See *Silver*.

Comets. See *Meteors*.

The INDEX.

D.

- Two Deaf and Dumb Persons** that understand what is said by the Motion of the Lips. No. 312. p. 2468.
- A Deaf and Dumb Person** that recover'd his Speech and Hearing after a Fever. No. 312. p. 2469.
- Diamonds**, their Figure, and that they do not increafe. No. 311. p. 2425.
- Diseases.** *Gout*, the Method of Curing it. N. 310. p. 2435. *Jaundice* occasion'd by a Stone obstructing the *Ductus communis biliaris*. No. 306. p. 2233. *Small-Pox* prevented by an Infusion of *Juniper-wood*. N. 312. p. 2470.
- Dissections.** Observations in the *Dissection* of Human Bodies. N. 307. p. 2283. *Dissection* of *John Bayles*, Aged 130 Years. N. 306. p. 2247. *Dissection* of a *Hare*. No. 307. p. 2302. *Dissection* of a *Mountain-Hen*. No. 307. p. 2303.

E.

- Eclipse of the Sun**, May 1. 1706. observed at *Greenwich*. No. 306. p. 2237. at *Canterbury*. No. 306. p. 2238. at *Horton* in *Yorkshire*. No. 306. p. 2239. at *Bern* in *Switzerland*, p. 2240. at *Geneva*, p. 2241. at *Marseilles*, p. 2244. at *Zuric*, p. 2246.
- Eclipse of the Moon** observed at *Zuric*, Apr. 17. 1707. No. 310. p. 2394. at *Boston* in *New-England*. No. 312. p. 2471.
- Experiments.** The Proportion of the Weight of *Air* to the Weight of the like Bulk of *Water*. No. 305. p. 2221. The Spontaneous Ascent of *Water* in small Tubes, is the same in *Vacuo*, as in open *Air*. No. 305. p. 2223. The Production of *Light* from the Attrition of the Hands on a *Glass Globe* exhausted of *Air*. No. 307. p. 2227. The Electricity of *Glass*. No. 308. p. 2327.

The INDEX.

The Attrition of *Glass*. No 308. p. 2332. Light produced by the *Effluvia* of one *Glass* falling on another in motion. No. 310. p. 2313. The Quantity of *Air* produced from a certain Quantity of *Gunpowder*. N. 311. p. 2409. *Air* compressed requires time to recover its Natural State. N. 311. p. 2412. The Difficulty of separating two Hemispheres upon Injecting an Atmosphere of *Air* on their outward Surfaces. No. 310. p. 2415.

F.

Flea, Microscopical Observations on its Sting. No. 307. p. 2311.

G.

Glass produces Light by Attrition. N. 310. p. 2413. See more in *Experiments*.
Gunpowder, what Quantity of *Air* produced from it. No. 311. p. 2409.

H.

Balls of *Hair* found in the *Uterus*. No. 309. p. 2387.
Healthiness of the Parishes of *Kinardsey* and *Donington*. No. 310. p. 2418.
Hottentots, their Customs and Manner of Living. No. 310. p. 2424.
Hydatides. See *Anatomical* Observations:
Hypocausta. See *Antiquities*.

I.

Jaundice. See *Diseases*.
Jesuits Bark, the Figure of its Parts. No. 312. p. 2446.
Juniper-

The INDEX.

Juniper wood, an Infusion of it used to prevent the Small-Pox. No. 312. p. 2470.

L.

The ninth *Legion* refled at *York*. No. 305. p. 2914.

Light produced from Glass by Attrition. No. 310. p. 2413.

Light observed in the Heavens. See *Meteors*.

Lyons, the manner of Killing them at the *Cape of Good Hope*. No. 311. p. 2430.

M.

Magnetical Needle, its Variation in the *Atlantick* and *Aethiopic* Oceans. No. 310 p. 2433.

Mathematical Matters. The Construction and Properties of a new *Quadratick* to the *Hyperbola*. No. 306. p. 2253. The Resolution of *Cubic* and *Biquadratic* *Æquations*. No. 309. p. 2353. Analytical Resolution of *Æquations*, &c. No. 309. p. 2368. A Defence of D. *Gregorie's* *Mathematicks*. No. 308. p. 2336.

Meteors, A Glade of *Light* observed in the Heavens. No. 305 p. 2220. A *Pyramidal* Appearance in the Heavens. No. 310. p. 2411. Observations on the *Comet* that appeared at *Rome* 1664. No. 309. p. 2350.

Microscopical Observations on the *Seeds* of some *East-India* Plants. No. 305. p. 2205. on the Structure of the *Spleen*. No. 307. p. 2307. on the *Sign* of a *Fever*. No. 307. p. 2311. on the *Salts* of *Pearls* and *Oyster-shells*. No. 311. p. 2416. on the *Particles* of *Silver*, &c. No. 311. p. 2425. on the *Jesuits Bark*. No. 312. p. 2446. on the *Thrush* in *Fevers*. No. 312. p. 2456.

Minerals in the *Philippine Islands*. No. 311. p. 2404.

Mineral Waters. See *Waters*.

Monsters in the *Philippine Islands* described. No. 307. p. 2266. *Monstrous* Human Birth. No. 308. p. 2345. *Monstrous* Calf. No. 311. 2414. Moon.

The INDEX.

Moon. See *Eclipse of the Moon.*

Atmosphere round the Moon. See *Atmosphere.*

N.

Natural History. See *Books.*

Natural Observations in Kinardsey and Donington. No. 310. p. 2418.

O.

Old Age. See *Aged People.*

Oyster-shells, the Figure of their Parts, and that they are of no use in Physick. No. 311. p. 2422.

P.

Pearls, the Figure of their Salts. No. 311. p. 2417. not dissoluble by the Stomach. p. 2420. of no use in Physick. p. 2421.

Pediculus Cæti. See *Animals.*

Printing, its first Invention, Progress, and Improvement. No. 310. p. 2397.

Q.

Quadratrix to the *Hyperbola.* No. 306. p. 2253.

Quadrupeds. See *Animals.*

R.

Storm of Rain at *Denbigh.* No. 308. p. 2342. The Quantity of *Rain* that fell in the Year 1705. No. 309. p. 2378.

Roman Inscriptions. See *Antiquities.*

Royal Oak, an Inscription on the Wall that incloses it. No. 310. p. 2422.

S.

The INDEX.

S.

- Salt*, how made at the *Cape of Good Hope*. No. 310. p. 2433.
Salts of Pearls, Oyster shells, &c. See *Microscopical Observations*.
Serpents of the *Philippine Islands*. No. 307. p. 2272.
Seeds of some *East-India* Plants and their Virtues. No. 305. p. 2205.
Fossil-shells near *Mears-Ashby* in *Northamptonshire*. No. 305. p. 2210. *Shells* in the *Philippine Islands*. No. 311. p. 2397.
Silver, the Figure of its Salts. No. 311. p. 2425.
Spleen, the Structure of its Parts. No. 307. p. 2305.
Stone obstructing the Gall-Vessels. No. 306. p. 2233.
Storm of Rain. See *Rain*.
Sun. See *Eclipse*.

T.

- Thrush* See *Whitnefs* on the Tongue in Fevers.
Tyger, a remarkable instance of their *Fiercenefs*. N. 310. p. 2431.
Types for Printing first invented. No. 310. p. 2399.

U.

- Ulcers* in the Arm No. 312. p. 2466.
Uterus Schirrous. See *Anatomical Observations*.

W.

- An Eruption of *Waters* in *Craven*. No. 306. p. 2236.
A Mineral *Water* at *Canterbury*. No. 312. p. 2462.
A Table of the *Weather, Winds, &c.* for the Year 1705. No. 309. p. 2378.
Whitenefs of the Tongue in Fevers. No. 312. p. 1456.

The INDEX.

BOOKS,

Of which some Account is given in these *Transactions*.

Account of Mr. *Bagford's* Collections for the History of Printing. No. 310. p. 2407.

Account of Mr. *Morton's* Progress in the Natural History of *Norhamptonshire*. No. 305. p. 2213.

Manuscripts left by the late Reverend Mr. *John Ray*. No. 307. p. 2282.

Second Volume of Sir *Rob. Sibbald's Prodrômus Historiæ Naturalis Scotiæ* preparing for the Press. No. 308. p. 2314.

Vindiciæ Matheseos Universalis Gregorianæ contra secundos *Abbatís Galloysij* impetus, &c. No. 308. p. 2336.

De Arthritide Anomala, sive Interna, Dissertatio. Auctore *Guil. Musgrave, M. D.* No. 310. p. 2435.

Archæologia Britannica. Vol. I. By *Edw. Lbuid, M. A.* No. 311. 2438.

A Treatise of *St. George's Bath* by *Landeck*, in the Lordship of *Glatz*, near *Silesia*. By *Dr. Ehm*. No. 308. p. 2346.

Samuelis Dale Pharmacologiæ seu Manuductionis ad Materiam Medicam Supplementum. No. 306. p. 2253.

The Natural History of *Jamaica*. Vol. I. By *Dr. Hans Sloane*. No. 311. p. 2433.

The Whole Art of Husbandry. By *J. M. Esq*; No. 310. p. 2442.

L O N D O N,

Printed for *B. Walford*, Printer to the *Royal Society*, at the *Prince's-Arms* in *St. Paul's Church-yard*.

MDCCLXVIII

PHILOSOPHICAL
TRANSACTIONS.

Giving some

ACCOUNT

OF THE

Present Undertakings, Studies and Labours

OF THE

INGENIOUS,

In many

Considerable Parts of the World.

VOL. XXVI. For the Years 1708 and 1709.

L O N D O N:

Printed for H. Clements, at the *Half-Moon* in St Paul's
Church-Yard. MDCCX.

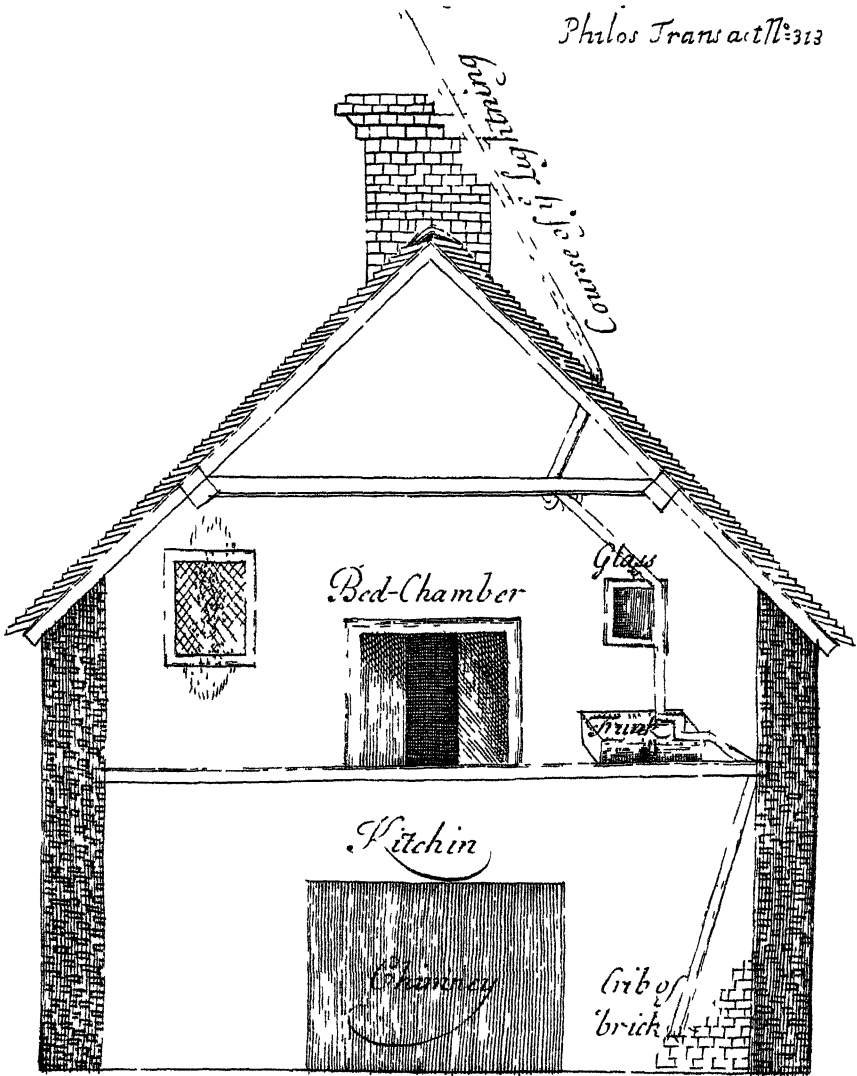
TO
Sir Isaac Newton, K^t
P R E S I D E N T

And to the
Council and Fellows
OF THE
Royal Society
OF
L O N D O N,
FOR THE
Advancement of *Natural Knowledge*;

THIS
Twenty Sixth VOLUME
OF THE
Philosophical Transactions
IS

HUMBLY DEDICATED
BY

Hans Sloane, R. S. Secr.



PHILOSOPHICAL TRANSACTIONS.

For the Months of January and February, 1708.

The CONTENTS.

- I. Experimenta & Observationes de Soni Motu, aliisque ad id attinentibus, factæ à Reverendo D. W. Derham Ecclesiæ Upminsteriænsis Rectore, & Societatis Regalis Londinensis Sociis.
- II. *A Relation of the strange Effects of Thunder and Lightning, which happened at Mrs. Clore's House at New-Forge, in the County of Down in Ireland, on the 5th of August, 1707. Communicated by Samuel Molyneux Esq; Secretary of the Philosophical Society at Dublin.*
- III. *Part of a Letter from Dr. Archibald Adams, to Dr. Hans Sloane, R. S. Secr. concerning an Apoplectick Person, in whom, from an Obstruction in the Left Ventricle of the Brain, the Nerves on the Opposite side were affected.*
- IV. *A Letter from Mr. Ra Caley, to Mr. William Cowper, F. R. S. concerning a Woman 62 Years of Age (who is still Living) that lost her Leg and greatest part of her Thigh by a Gangrene.*
- V. *The Manner of making Styrax liquida, alias Rosa Mal-las. Communicated by Mr. James Petiver, F. R. S.*

- i. *Experimenta & Observationes de Soni Motu, alijsque ad id attinentibus, factæ a Reverendo D. W. Derham Ecclesiæ Upminstoriensis Rectore, & Societatis Regiæ Londinensis Socio.*

§. I. *Celeberrimorum Authorum dissensus de Soni Progressu, & Cæpi mei Ratio.*

Philosophi celeberrimi operæ pretium existimârunt, in jucundum & mysticum de Sono argumentum inquirere; speciatim de ejus *Motu & Progressu*.

Et quoniam magna inter eorum Observationes discrepantia est, ideo partim ut scrupulos meos eximerem; partim ut memet horis meis subsæcivis recrearem, conatus sum, quantum in me fuit, rem totam exponere & decernere.

Et quandoquidem Instrumenta mihi sunt aptissima, occasioneque non contemnendæ rem experiendi, ideo hoc faciendo, arbitror me tantum proprium munus obire, sive debitum solvere Mundo Philosophico, præcipuè insignissimæ *Societati nostræ Regali*, quæ me in suum numerum cooptare dignata est.

Dissensus inter Authores celeberrimos de Soni Velocitate facili intuitu in sequente Tabellâ conspicui potest: in quâ (Pedibus Anglicanis) Spatium exhibetur quod Sonorum Progressui in uno Minuto Secundo Temporis ascribunt.

Pedes

D. H. Newton Eq. Aul.	968 Prin. Ph. Nat. Math. L. 7 Prop. 30.
Nobilis D. Roberts	1300 Philos. Transact. N. 209.
Nobilis D. Boyle	1200 Essay of Languid Motion p. 24.
D. Walker	1338 Philos. Transact. N. 247.
Mersennus	1474 Balistic. Prop. 39.
D. Flamsteed & Halley	1142
Florentini celebres	1148 Exp. per Acad. d. l. Cimen. p. 141.
Galli celebres	1172 Du Hamel Hist. Acad. Reg.

Inter ultimum & penultimum dissensus non est magnus, & *Gallorum* non multo major; cæterorum vero magnus est. Et Ratio manifestè hæc est; vel scilicet ab Instrumenti detectu; vel à Distantiâ; vel à Ventis.

1. *Instrumentum*, quo nonnulli virorum horum inclinatorum dimensi sunt, non fuit *Automaton*; sed *Bolis funi pendula*, quæ Minuta Secunda vibrat. Sed omnibus, in hisce rebus exercitis, manifestum est, Bolidem multò minus commodum esse, nec tam accuratam ac *Automaton*; quoniam necessarium est, Oculum primò occupatum esse in observando Coruscationem, deinde ad Bolidem, sive Pendulum respicere: quod tempus conterit, & confusio-nem creat. Hoc autem, unà cum Sensuum, & Captûs sive Attentionis nostræ tarditate, magnum errorem efficere potest; uti bene notum est iis qui Experimenta de his fecerunt. Præsertim si.

2. *Intervallum* inter rem sonantem, & Observatorem parvum fuerit. At vero manifestum est, quòd plerique istorum laudatorum Virorum Experimenta sua iecerunt ad intervallum tantum paucorum Pedum, & per Soni redditum, sive Echo dimensi sunt. Horum enim nonnulli vix ultra 6 vel 700 pedes mensurationem extendebant, alique non ultra Milliare unum. Sed semper observavi ambiguitatem oriri in tam parvâ distantia, quamvis optimum adhiberetur Instrumentum. Errorque levissimus in
tan-

tantillis distantis, magnus est habendus. Nam Pendulum forsan dimidium sui diadromi, sive arcus, præterit ab ultimâ pulsatione, cum Sonus primò fuerit emissus: Sed nos istum Pulsus numeramus, ac si Vibratio fuisset tota & completa; vel forsan Vibrationem anticipamus. Et postquam Sonus nos pertigit, forsan plus vel minus quam par est numeramus.

Vel si Distantia sat fuerit longa, tamen error exinde potest oriri, si

3. *Ventorum* ratio non sit habita. De quo in sequentibus.

Hæc sunt certa, inevitabilia, & perpetua incommoda, quæ Mensurationem progressus Sonorum comitantur: quæ in parvis intervallis (ut dixi) præsertim si Instrumenta mala sint, magnos errores producere possunt: & sine dubio maxima fuere causa tanti inter tantos Authores dissensus.

Sed observari potest, quod Spatia à tribus ultimis in Tabella Observatoribus assignata, quam proximè conveniunt. Quod proculdubio hinc provenit, quia nempe bonis Automatis instructi fuerunt. In quorum usu, *Auris* sola occupatur in Vibrationibus Penduli excipiendis, dum *Oculus* attendit Coruscationem, sive aliquam aliam Soni emissionem. Hæ quoque Observationes intervallis longinquis factæ fuere, in quibus error pusillus non magni erit. Dominorum enim celeberrimorum *Flamsteedii* & *Halleii* Observationes factæ sunt ad intervallum trium fere milliarii (paucis Perticis plus vel minus exceptis) ab Observatorio Regio, super Collem *Shooterianum*: & Sonus advenit in $13 \frac{1}{4}$ Secundis Temporis. Nobiles isti *Florentini* & celeberrimi ex *Acad. del Cimento* ad idem fere intervallum Experimenta sua fecerunt; & quædam ad intervallum unius tantum Milliarii. Et denique celeberrimi *D. D. Cassini*, *Picard*, & *Rœmer* ad intervallum 1280 Hexapedarum Gallicarum, quod est plus quam $1 \frac{1}{2}$ Milliare Anglicanum.

Ut veritas inter prædicta diffidia innotescat, experientia plurima ad varia intervalla feci; Scilicet ab uno, ad 12 miliaria, & plura. Et ad Tempus dimetiendum, libellæ accuratissimum *Automaton portabile*, cum Pendulo Scissilicunda vibrante.

Tandem autem ut procederem, sequentes Quæstiones à meipso discutiendas proposui.

1. Quantum Spatium Sonus percurrit in Secundo Minuto Temporis, vel alio Temporis-intervallo?
2. An Sclopus versus Observatorem displotus, in eodem temporis intervallo Sonum mittit, ac cum in contrariam partem displotatur?
3. An in quolibet Atmosphæræ statu, cum Mercurius in Barometro ascendit vel descendit, Soni percurrunt idem Spatium in eodem Temporis intervallo?
4. An Soni velocius Die quam Nocte moventur?
5. An Ventus favens Sonum accelerat, & adversus retardat? Sive an, & quomodo Venti Sonum afficiunt?
6. An tranquillo Cœlo Sonus velocis movetur, quam Vento flante?
7. An vehemens Ventus in transversum flans accelerat, an retardat motum Soni?
8. An Soni eundem habent motum Estate ac Hyeme, Die ac Nocte?
9. An etiam in Nivoso, ac Sudo Cœlo?
10. An Sonus magnus & exiguus eundem habent motum?
11. An in omnibus Sclopeti elevationibus, viz. Horizontali, 10 gr. 20 gr. ad 90 gr. Sonus in eodem temporis intervallo Observatoris aurem pertingit?
12. An omnimodi Soni, Scloppetorum, Campanarum, Malleorum, &c. eundem habent motum?
13. An variæ Pulveris Pyrii vires motum Soni variant?

14. An in Culminibus Montium, aliorum, & Vallibus, five in summis Atmosphaeræ partibus, & imis, Soni idem percurrunt Spatium in eodem Temporis intervallo?

15. An Sonus acclivis & declivis eundem habet motum? Sive an à Jugo Montis descendit in Radicem eodem passu, ac à Radice ascendit in Jugum?

16. An Sonus principio velocius, & in fine tardius movetur, ut in plurimis aliis motibus violentis accidit?

17. Annon potius sit æquabilis? Neinpe Annon in dimidio Temporis, dimidium Spatii; in quartâ parte Temporis, quartam partem Spatii, &c. movetur?

18. An in omnibus Regionibus, Septentrionalibus, & Australibus, in *Angliâ*, *Galliâ*, *Italiâ*, *Germaniâ*, &c. eundem habent motum?

19. An Sonus rectâ, five brevissimo uincte, à loco in locum transit; an secundum superficiem interjacentis telluris?

Ad hæc determinanda Amicos Generosos mihi vicino petii (quorum beneficia hîc gratissimè agnosco) ut Scloppos ex Turribus, aliisque locis eminentibus disploderent, ad intervallum 1, 2, 3, usque ad 8 milia passuum (quod maximum esse intervallum reperi, ex quo Sclopi Sonum audire potui in his partibus, arboribus, &c. obsitis.) Hæc Scloppeta magno mihi fuerunt usui. Sed Tormenta, quæ maximè proposito intervalebant, bellica illa fuerunt apud *Blackheath* [*Sakers* vocata] quæ exercentur in educandis Tyronibus Tormentariis Inclytissimæ nostræ Reginae ministraturis. Horum Tormentorum micantes flammulas ex Ecclesiæ nostræ turre videre, & fragorem audire potui in omnibus ierè coeli tempestatibus; etiam interdum, ope Telescopii. Idcoque cum omni curâ & diligentia me ad horum Tormentorum observationem acciuxi, usque à Febuario 1707.

Post paucas observationes inter eorum displensiones factas, speciale quoddam experimentum faciendum comparavi, benignitate nuperi D. Baronis *Granville* tunc Præscti,

fieri, & cæterorum Virorum clarorum qui in *Torre Lincæ* Rei Tormentariæ Regiæ ministrant (quorum beneficia hic graſſiſſimè agnoſco.) Duo Tormenta bellica (*Sakers* vocata) juxta ſe ſita ſunt, adverſo unius ore, adverſo alterius. Hæc duo Tormenta Feb. 13. 1701. diſpoſita fuere, utſequens ſonitus non ab Hor. ſexti poſmeridiam ad mediæ noctem, ſed ſonitus directè adverſus Sonum ſonante. Tempus intervallum inter Conſonantiam utriusque Tormenti (quæ nudo oculo videre poſſui) & ſonitus adventum, ſemper fuit circiter 120 vel 122 Semifecunda Temporis. Dixi 120 vel 122, quoniam Sonus à loco utriusque Tormenti ſcil. prior Sonus intra 120 Semifecunda (ſonitus languidior) ſecundus intra 122 (qui intentionior.) Et eodem modo, per totum obſervationis tempus, ſingulorum Tormentorum fragor advenit, nempe duplicatus.

Hæc Reduplicatio Soni mihi videtur Echo, repercuffa, ut opinor, a *Mountain Blackwater*, vel *Deſcibus* juxta ſitis. De quo nullam habeo Dubitandi rationem præſententiam contrariam Amici cuſſiam docti, & ſagaces Philoſophi; qui credis nullam Echo adduci, niſi quæ facta eſt per Objecta Phonocamptica non procul ab Obſervatore, non per ea prope Vocale, ſive Sonorum, vel alia longinqua Objecta. Proxima igitur Diſquiſitio erit

§. 2. De Sonis longè repercuffis, ſive Echo longinquis.

Pro Digreſſione forſan habitur hæc Diſquiſitio: ſed quoniam ad Soni ſubjectum attinet, ideo paucis de hæc re Obſervationes ingenioſis non fore ingratas ſpero.

Et prius hoc Legibus Echus non contrarium credo. Deinde notandum eſt, hunc duplicem Sonum directè à *Blackheath* veniſſe: à que enim prior Sonus inde veniebat, & iter Echus more; aliunde; nempe ultra me, vel à dextrâ, vel à ſinistra, vel ab ulâ aliâ parte. Idemque ſæpius obſervavi, cum Tormenta magna è Navibus diſſoderentur in *Fluvio Thamesi* (præcipue ſi aer fuerit ſerenus

et 2 an milia, vel e, & 3 milia, cum Tormenta Vigilant
(Anglice) *Watched* conerentur. Postquam fragor
Tormenti minime cegit, audiui eum longe per aruente
secus Fluvium, & à Rupa, Montibus, & Scopulis (juxta
Hucus *Contiumum* contentum fuis) per plura Milia vel o
mnia in

Hæc omnia inquit Amicus, à Ponticu fons Domus,
&c. prope Te, proveniunt. Sed quia te Debitate Soni
dicam, perquam plurima Milia, & de ejus
dem incipiente fuit, non de veniente, non de recedente
per Objecta. Ponebat tunc juxta vel prope, non
quàm per Objecta. Ponebat tunc juxta vel prope, non
(ut nihil de his de exemplis, utam vel per dabo,
ut de his de his, utam vel per dabo, ut de his de his,
Phonographia prope Rem vocat, utam vel per dabo,
per plura Milia audiui, æquè ac per plura Soni, ut
quando etiam eodem intuentur.

Sæpe observavi Tormenta magna bellica è Navibus in
Thamesi Fluvio vespere displosa circa loca vocata *Deptford*
& *Cockle-Pont*, plerumque trigorem edere duplicatum,
triplicatum, quadruplicatum, vel adhuc a pluri multiplicatum,
& quod fragores posteriores sunt magis Sonori.
Et cum hinc & illinc Stadium, etiam quadrantem vel di-
midium Miliaris in transversum ivi, Sonus canon idem
fuit. Idem quod octavo Martii novissime elipsi pluri-
mæ Bombardæ magnæ displosæ fuisse alicubi inter *Dept-*
ford & *Cockle-Pont* prædictas, è Nave quam in *Thamesi*
ex mea Ecclesiâ prospexi. Harum fragor quinquies vel

sexies hoc modo repetitus est 9999. Inter Co-

reflexionem & Sonum 122 Sensuenda nuntiavi Ver-
to in transversum stante. Tunc tinnoris ideo Tor-
menta non turbant plus quam 13 milia passuum. Duo
primi crepitus languidiores erant quam tertii; sed crepitus
ultimus omnium maximè Sonori. Et cum à dextrâ qua-

drantem

[illegible]

Alia hujus generis Observatio de quodam die Domini-
nico, quod videtur unum vel triennium adire. Et Sono Tor-
menti, nomen militare, s. diffusi alibi in Turcia, et alio-
ris vel trans Oceanum Græcorum vocatur. Hujus Tor-
menti fragor, ut in hunc ad nostrum est, et no-
vies, vel decies iterum, et iterum iterum iterum iterum

१०५७३२४

rimi (ad Dei cultum tunc temporis accedentibus) putabant
esse Fragores multorum Formicarum e Nave emicantibus:
(Sed. ut opinor. nil aliud fuit. nisi Hypophosphorum, ex
unius vel alterius & aliorum Temporis Confessi Sotis, à
Navibus pleribus vel Lutore fixis. Gurgite effusa.) Quid
autem promittat, hoc est, quod nonnulli ad hunc usque
in meo Hunc deambularem, audivi, sed per unum meum
qui proci distabant. Item D. Bar. (Societatis nostrae
Regiae ingeniosus & doctus Socius) Constantinæ eandem re-
petiturum Sonum audivit, ad intervallum 4 fere miliaria
ab *Uppinister*, ubi ipse audivi.

Ex quibus omnibus luculentè constat. Cuiusmodi sunt
dicti Amici (plurimus nominatus colendus) etc. etc.

S. 3. De Echo, five Repetitione. S. 4. 11. 12. 13. 14. 15. 16. 17. 18. 19. 20. 21. 22. 23. 24. 25. 26. 27. 28. 29. 30. 31. 32. 33. 34. 35. 36. 37. 38. 39. 40. 41. 42. 43. 44. 45. 46. 47. 48. 49. 50. 51. 52. 53. 54. 55. 56. 57. 58. 59. 60. 61. 62. 63. 64. 65. 66. 67. 68. 69. 70. 71. 72. 73. 74. 75. 76. 77. 78. 79. 80. 81. 82. 83. 84. 85. 86. 87. 88. 89. 90. 91. 92. 93. 94. 95. 96. 97. 98. 99. 100. 101. 102. 103. 104. 105. 106. 107. 108. 109. 110. 111. 112. 113. 114. 115. 116. 117. 118. 119. 120. 121. 122. 123. 124. 125. 126. 127. 128. 129. 130. 131. 132. 133. 134. 135. 136. 137. 138. 139. 140. 141. 142. 143. 144. 145. 146. 147. 148. 149. 150. 151. 152. 153. 154. 155. 156. 157. 158. 159. 160. 161. 162. 163. 164. 165. 166. 167. 168. 169. 170. 171. 172. 173. 174. 175. 176. 177. 178. 179. 180. 181. 182. 183. 184. 185. 186. 187. 188. 189. 190. 191. 192. 193. 194. 195. 196. 197. 198. 199. 200. 201. 202. 203. 204. 205. 206. 207. 208. 209. 210. 211. 212. 213. 214. 215. 216. 217. 218. 219. 220. 221. 222. 223. 224. 225. 226. 227. 228. 229. 230. 231. 232. 233. 234. 235. 236. 237. 238. 239. 240. 241. 242. 243. 244. 245. 246. 247. 248. 249. 250. 251. 252. 253. 254. 255. 256. 257. 258. 259. 260. 261. 262. 263. 264. 265. 266. 267. 268. 269. 270. 271. 272. 273. 274. 275. 276. 277. 278. 279. 280. 281. 282. 283. 284. 285. 286. 287. 288. 289. 290. 291. 292. 293. 294. 295. 296. 297. 298. 299. 300. 301. 302. 303. 304. 305. 306. 307. 308. 309. 310. 311. 312. 313. 314. 315. 316. 317. 318. 319. 320. 321. 322. 323. 324. 325. 326. 327. 328. 329. 330. 331. 332. 333. 334. 335. 336. 337. 338. 339. 340. 341. 342. 343. 344. 345. 346. 347. 348. 349. 350. 351. 352. 353. 354. 355. 356. 357. 358. 359. 360. 361. 362. 363. 364. 365. 366. 367. 368. 369. 370. 371. 372. 373. 374. 375. 376. 377. 378. 379. 380. 381. 382. 383. 384. 385. 386. 387. 388. 389. 390. 391. 392. 393. 394. 395. 396. 397. 398. 399. 400. 401. 402. 403. 404. 405. 406. 407. 408. 409. 410. 411. 412. 413. 414. 415. 416. 417. 418. 419. 420. 421. 422. 423. 424. 425. 426. 427. 428. 429. 430. 431. 432. 433. 434. 435. 436. 437. 438. 439. 440. 441. 442. 443. 444. 445. 446. 447. 448. 449. 450. 451. 452. 453. 454. 455. 456. 457. 458. 459. 460. 461. 462. 463. 464. 465. 466. 467. 468. 469. 470. 471. 472. 473. 474. 475. 476. 477. 478. 479. 480. 481. 482. 483. 484. 485. 486. 487. 488. 489. 490. 491. 492. 493. 494. 495. 496. 497. 498. 499. 500. 501. 502. 503. 504. 505. 506. 507. 508. 509. 510. 511. 512. 513. 514. 515. 516. 517. 518. 519. 520. 521. 522. 523. 524. 525. 526. 527. 528. 529. 530. 531. 532. 533. 534. 535. 536. 537. 538. 539. 540. 541. 542. 543. 544. 545. 546. 547. 548. 549. 550. 551. 552. 553. 554. 555. 556. 557. 558. 559. 560. 561. 562. 563. 564. 565. 566. 567. 568. 569. 570. 571. 572. 573. 574. 575. 576. 577. 578. 579. 580. 581. 582. 583. 584. 585. 586. 587. 588. 589. 590. 591. 592. 593. 594. 595. 596. 597. 598. 599. 600. 601. 602. 603. 604. 605. 606. 607. 608. 609. 610. 611. 612. 613. 614. 615. 616. 617. 618. 619. 620. 621. 622. 623. 624. 625. 626. 627. 628. 629. 630. 631. 632. 633. 634. 635. 636. 637. 638. 639. 640. 641. 642. 643. 644. 645. 646. 647. 648. 649. 650. 651. 652. 653. 654. 655. 656. 657. 658. 659. 660. 661. 662. 663. 664. 665. 666. 667. 668. 669. 670. 671. 672. 673. 674. 675. 676. 677. 678. 679. 680. 681. 682. 683. 684. 685. 686. 687. 688. 689. 690. 691. 692. 693. 694. 695. 696. 697. 698. 699. 700. 701. 702. 703. 704. 705. 706. 707. 708. 709. 710. 711. 712. 713. 714. 715. 716. 717. 718. 719. 720. 721. 722. 723. 724. 725. 726. 727. 728. 729. 730. 731. 732. 733. 734. 735. 736. 737. 738. 739. 740. 741. 742. 743. 744. 745. 746. 747. 748. 749. 750. 751. 752. 753. 754. 755. 756. 757. 758. 759. 760. 761. 762. 763. 764. 765. 766. 767. 768. 769. 770. 771. 772. 773. 774. 775. 776. 777. 778. 779. 780. 781. 782. 783. 784. 785. 786. 787. 788. 789. 790. 791. 792. 793. 794. 795. 796. 797. 798. 799. 800. 801. 802. 803. 804. 805. 806. 807. 808. 809. 810. 811. 812. 813. 814. 815. 816. 817. 818. 819. 820. 821. 822. 823. 824. 825. 826. 827. 828. 829. 830. 831. 832. 833. 834. 835. 836. 837. 838. 839. 840. 841. 842. 843.

Hic de *Echo* dictis. Spero non ingratum fore exemplum.
adjuncto de *Reperensione Soni* et, *auris* partia *in*; quod
potest et finire quæ dicta sunt.

Cum autem in Fragores magnorum Tormen torum ventorum, præcipue in tranquillo & sereno Cælo, forte u-

meo observavi *Murmur*, exesse in aere, praecessisse Clap-
porem. Et in *Nel tenne*, sapè Bombardum Sonum
audivi in saepe superiorem, in aere, per plurimum Mil-
liaria percurrentem; ita ut Murmur istud per 15^{1^a}
tempons perduraverit. Quoniam hoc Murmur, meo ju-
dicio, proveniat a Partibus Vaporosis in atmosphera sus-
tensis, quae cursui Ul dulcissimi Soni oppugnant, easque
Observatoris auribus reverberant, indefinitum namq̃ mo-
re: quas *Murmur in aere* vocamus.

Iis rite perpensis, manifestum erit Echo longinquè fi-
liam posse audiri; & Reduplicationem istam praestanti-
fragoris Tormentorum *Blackbeathensium* proculdubio ve-
nisse ab ipso *Blackbeath*, prout modo asserui.

§. 4. De Sonis Sclopetorum omnimodis dispositorum, &c.

Ut autem redeam à Digressionem de Repercussione Sono-
rum, pergam ad Observationes meas de eorum *Progressu*,
quas ex plurimis Experimentis feci. Et quod jamjam de
Sono Bombardarum *Blackbeathensium* suggesti, in omnibus
aliis reperi, viz Motum Soni nec velociorem nec tardio-
rem esse, siue Tormentum versus Observatorem, siue è
contrario displodatur.

In omnibus item *Sclopi positionibus*, Horizontali, Erecta;
& in omnibus ejusdem elevationibus, 10 gr. 20 gr. &c.
nulla est variatio Soni. Adeo vera est illa de hac re ob-
servatio Nobilium & Inclytorum istorum Virorum ex *Acu-
demia del Cimento Florentiae*.

Pulveris Pyrii quoque Vis, siue sit fortis, siue debilis,
ejusque major vel minor Quantitas, licet augeat, vel mi-
nuat Sonum, non tamen accelerat, aut retardat ejusdem
Motum.

§. 5. De Motu Soni in qualibet Cæli, & Annæ intensitate.

Kircherus dicit se semper diversam Soni celeritatem invenisse, diversis temporibus. *nunè, meridie, vesperi, noctu.* Phonurg. 1. c. 1. Præf. 5. v.
Sed ego (melioris Chronometri fretus, & commodiore distantia) nunquam reperi claritatem Soni esse diversam his temporibus. In omni aucta celeritate, sive Cælum sit *Sudum & Serenum*, sive *Nubilejum & Turbidum*; sive *Nix* decidit, sive *Nebula* (quæ ambæ fortiter retinuerunt Soni Audibilitatem;) seu *Ionat*, aut *Fulurat*; sive *Hæsus* vel *Frigus* adurit; sive *Dies*, vel *Nox* sit, *Hæsus* vel *Hymus*; sive *Mercurius* in *Barometro* ascendit vel descendit: verbo dicam, in omnibus quibuscunque Atmosphæræ mutationibus (Ventis tantum exceptis) Motus Soni nec velocior nec tardior est; tantum magis vel minus clarus est ex illa Medii variatione. Quod forsitan *Kircherum* sagacem decepit.

Hinc sequitur Conclusiones D. *Walker* à Doctoris *Ploet*, *Philos. Acad. Kircheri*, & suis ingenuis Observationibus deductas er. N. 207. roneas fuisse.

§. 6. De Motu Soni intensi & languidi, & diversorum corporum Sonantium.

Licet *Kircherus* contrà sentiat, attamen non dubito quin omnium corporum Strepitus, Sclopetorum, Campanarum, Malleorum &c. eandem Velocitatem habeant. Anno 1704. Pullationes Mallei & Fregi in Sclopeti comparavi, ad Milliaris intervallum (maximum sonum ad quod Mallei sonum audire posui) & reperi utrorumque Sonum in eodem tempore advenisse: & quod $\frac{1}{2}$, $\frac{1}{3}$, & $\frac{1}{4}$ ejusdem Spatii pertransiverant in $\frac{1}{2}$, $\frac{1}{3}$, & $\frac{1}{4}$ ejusdem temporis.

Quod ad Sonos *Incusæ* & *Incusæ* & *Incusæ*, non dubito quin idem si quæ in eodem Tempore inter se percussant. Ut ex his Experimentis alia q̃ ex p̃te manifesta non erit.

Jan. 13. 1705. Archibombardarius *Arct. T. H. 1705* hortatu disposuit unum & alterum Scelopos, & Tormentum magnum Militare, in quod injectum pulverem pyrum bene distulerat. Horum omnium sonus in eodem tempore ad me, tria circiter miliaria distantiam, pervenit.

Archibombardarius quoque *Angliæ* Sept. 11. 1705. post Solis occasum, in mei gratiam, disposuit tueri *Bucketh* nonnullos Scelopos (*Anglicè Muskets*.) Tormenta magna bellicosa (*Sakers* vocata,) & Pyroboli (*Artificii Mortari*.) Scelopos exaudire non potui propter magnam distantiam, vel quia aer non sat serenus fuit. Sed Tormentum & Pyrobolorum Sonos in eodem Tempore in cavillo exaudivi, licet Frigor Pyroboli fuit multo torpidior & remissior, quàm Tormentorum.

Quaquam maximam curam in his Experimentis adhibui, postea tamen idem denuo ad majora intervalla experiri velle, sed defuit opportunitas. Hoc proinde aliis melius tentandum relinquo.

§. 7. De *Æquabilitate Motûs Soni.*

Proxima Observatio erat de *Æquabilitate Motûs Sonorum.* Quam quidem talem esse deprehendi, qualem *Academia del Cimento* illustris dudum præsumpsit. Soni quippe progrediuntur Dimidium Spatium in Dimidio Temporis intervallo; Quartam Spatii partem in Quarto Temporis intervallo; & sic deinceps. Quod ex exemplis in sequenti Tabellâ constabit.

Locus quo displotio facta fuit.	Penduli Vibrat. nume- rus.	Distantia Locorum.		Ventorum Tendentia
		Trigono- metricè.	Per Sonum.	
		Milliaria.	Milliaria.	
Hornchurch Ecclesia	9	0, 9875		transverso.
Okendon Bor. Ecclef.	18 $\frac{1}{2}$	2, 004	2, 0	transverso.
Mola Upminsteriensis	22 $\frac{1}{2}$	2, 4	2, 4	favent.
Warley parvæ Ecclef.	23	3, 0	2, 48	nive:transv.
Rainham Ecclef.	27 $\frac{1}{2}$	3, 58	2, 97	forte favent.
Mola Alveleientis	33 $\frac{1}{4}$	3, 58	3, 59	transverso.
Dagenham Ecclef.	33	3, 85	3, 57	transverso.
Weal Austrin. Ecclef.	35	4, 59	3, 78	faventi.
Thorndon Orient. Ecc.	45	5, 09	4, 86	transverso.
Barking Ecclesia	46 $\frac{1}{2}$	7, 7	5, 03	paulò fav.
Tormenta Blackheath	70 $\frac{1}{4}$	12, 5	7, 62	favente.
	116		12, 55	transverso.

Intervalla Locorum ab *Upminster* (ubi observavi) in hac Tabellâ notata, quantâ potui accuratione dimensus sum vel Virgâ Mensuratoriâ, vel Arte Trigonometricâ. Et ex magnâ consonantiâ inter intervalla hoc modo, eademque per Soni motum dimensa, cum Instrumentorum meorum præstantia, tum Observationum & Calculorum veritas patet. Differentia enim inter Intervalla dimensa, & eadem Sono capta, aut prorsus nulla est, aut tantum paucularum centesimarum partium, nisi cum Ventus fuerit secundus (Ecclesiâ *Weal Austrinæ* exceptâ, de quo posthac.) Ita nempe in Observationibus ex Ecclesiis *Dagenhamensi*, *Warleienſi*, *Thorndonienſi*, & *Barkingensi* factis, distantia per Sonum notatæ paulò breviores visæ sunt; quia Ventus Sonum acceleravit. At in conficiendâ hac Distantiarum per Sonum Columnâ, nihil propter Ventorum accelerationem concessi; sed numerum Vibrationum, sive Semi-secundorum tantum divisi per $9\frac{1}{4}$, vel 9,25 (numerum Semi-secundorum in quibus Sonus Mille passus transit.)

Æquabilitas quoque motus Soni ex hac Tabella manifesta est; prout patebit ex collatione Vibrationum & Distantiarum: sive ex solâ Columnâ Distantiarum per Sonum.

Ut autem nihil deesset in harum rerum confirmacione, iter feci ad *Arenas Fontnesianas* in littore nostro *Ljssiana*. Hæ Arenæ (Maris quotidiano Ætate allutæ, & obiecta) faciunt magnam & exactam Planitiem multorum miliarium. Super hanc Planitiem tantum sex miliaria dimensus sum, quia neque Maris æstus, neque mora mea ut angustius intervallum dimitterer, permitterent. Ad singula scilicet Milliaris finem experimenta feci per Soloquebum Explosionem, non sine magno Viræ periculo, ex Martis Flutu, & Noctis tenebris. Ex quibus Experimentis comperti Observationes meas priores omnes iustissimas & veras fuisse, scilicet Sonum unum Milliare pertransire in $9\frac{1}{4}$ Semi-secundis: duo Milliaria in $18\frac{1}{4}$ Semi-secundis: tria Milliaria, in $27\frac{1}{4}$ Semi-secundis, & sic deinceps.

§. 8. *De Acclivi & Declivi Sonorum Motu: sive De eorundem Ascensu & Descensu. Item an rectâ, vel secundum interjacentis telluris superficiem à loco in locum transeunt?*

Quod ad 15 & 19 Quæsitâ attinet; ingenuè fateor me nunquam ullis quæ fieri hæctenus Experimentis mihi met ipsi super his rebus satisfecisse.

Et primò de Progressu Soni per brevissimam viam, in Quæst. 19. Ratio de hoc dubitandi fuit discrepantiâ inter spatium *Weal Villæ* & *Upminster* Trigonometricè, & per Sonum dimensum; prout in Tabella præcedenti exhibetur. Mensuratio Trigonometrica tot modis, & tam bonis Angulis capta est, ut de eâ nullus dubitem. Sed quoniam per Soni motum distantia major videtur, & superficies interjacentis Soli hujusmodi formam induit, qualis in hic figurâ



figurâ exhibetur ; ideo subdubitavi annon paululum tenuosſe Sonus vagatur ? ſive annon Acclivitas illa in faciens in (A) Soni Undulationibus oppugnando retundit, eaſque tardat ?

Ut nodum hunc quodammodo ſolverem, Experimentum fieri curavi, Sono Sclopi à Cacumine *Collis Langdonienſis* in Vallem ſubjacentem, ad intervallum 3,79 milia paſſuum. Intervallum Trigonometricè, ex Angulis & Baſi ſat magnis, benè dimenſum eſt ; & Experimentum factum, cum lenis aura paululum Sono oppoſuerit. Inter Coruſcationem & Crepitum $35 \frac{1}{2}$ Semi-ſecunda numeravi. Qui numerus ad intervallum adeo quadrat, & cum cæteris experimentis tam proximè convenit, ut non dubitandum ſit quin Sonus à Cacumine in vallem rectâ (per aerem) deſcenderit, & non juxta Superficiem curvatam interjacentis Soli.

Errorem igitur aliqualem fuiſſe credo in Obſervationibus *Wealienſibus* prædictis, quoniam nec in Experimento noviffimo *Langdonienſi*, neque in ullis aliis tale aliquid obſervavi.

Quod ad Soni Motum ſurſum & deorſum attinet ; an ſcilicet pari tenore eodemque gradu à Montis cacumine ad Radicem, & retrorſum ferantur ? Vix ſpero me unquam mihimet, vel aliis ſatiſfacturum. Neque enim *Eſſexia*, neque conterminis partibus, ſat alti Colles occurrunt, unde quis ſatis Experimentorum in hunc finem inſtituat.

Quippe omnium altissimi, quos huc usque videre contigit (quales sunt ii quos *Langdonenses* vocant) Semissem Stadii non multum superant. Jugum enim editissimum ejusdem dimensus sum tum Trigonometricè, tum Barometro portatili. Illudque, priore modo, 363 pedes altum esse reperio, posteriore modo

Superiore autem Æstate, cum in Occidentales Regni plagas iter facerem, Colle quodam, cujus Altitudinem paucis abhinc annis trium circiter Stadiorum fuisse (ni fallit memoria) dimetiendo compertus sum, experiri volui. Quo tempore, Ventus transversim, sed tam lenitè spirabat, ut candelam accensam haud extingueret, Scloppeta quædam & ad Radicem & Jugum Montis displodi jussi; Sonumque eodem ferè temporis intervallo utrinque pervenire Sensi. Si quam leviculam discrepantiam observavi, in hoc consistere videbatur, nempe quòd Sonus aliquanto citiùs in montem ascenderet, quam ab eodem descenderet.

Sed, ut dicam quod res est, vix potui eà quâ par est ~~duplex~~ tempus dimetiri, quippe infelicitè evenerat ut ipsum, quo usus sum, Chronometrum, aliquantulum, itinèris concussione, turbaretur.

Proinde hoc Experimentum aliis feliciùs, & certius capiendum relinquo. Atque, utinam politioris Literaturæ, Philosophiæque Cultores apud *Italos* (quibus infita est Ingenii curiosa felicitas) hoc ipsum ad *Alpes* experiri velint.

§. 5. De Sonorum translatione sive Motu in Italiâ.

Cum autem *Italorum* mentionem fecerim, haud alienum videtur referre Observationes quas in & Experimenta, in mei gratiam, ibidem facta ab acuto, doctissimo & humanissimo amico D. *Doctore Newton* Regiæ Majestatis Britannicæ *Florentiæ* Alegato. Ita verò se habuit occasio,

Ingeniosus nuper & egregius *Richardus Townleius* Armiger (Nomen inclytæ nostræ Societati familiare & gratum) Literis ad me datis Anno 1704. significaverat, “ Sonos rarè exaudiri *Romæ* tam longè ac in *Angliâ*, no-
 “ strisque *Borealibus Regionibus*. Speciatim vero aiebat,
 “ Se, cum *Romæ* commoratus est, dum Bombardæ quæ-
 “ dam *Castelli S. Angelo vocati*, ob læta nuncia displode-
 “ rentur, atque ipse super Montem *Trinitate* dictum sta-
 “ ret, observasse Sonum multò languidiorem eo loci fu-
 “ isse, quàm in ullo alio ad eandem distantiam sito. Et post ejus mortem Frater ejusdem mihi Scripto retulit, quod Anno 1688, “ Cum relicta *Roma* ad *Castellum Gon-*
 “ *dolfo* (eminentiorē quendam locum prope *Lacum Al-*
 “ *bannum*, duodecim circiter Italica Milliaria a *Roma*) ut
 “ bonas horas contereret, se contulerit, animadvertisse
 “ sonum Bombardarum magnarum à Castello (prædicto)
 “ *St. Angelo* obstrepentium, sibi tamen itummutum & de-
 “ bilem videri. Alio quoque tempore, cum Curru circa
 “ prædicti Castelli mœnia veheretur, Bombardæque ingen-
 “ tes erinde bo rent, nec talem tantumve Sonum ibi loci
 “ ac alibi emittere videbantur.

Cum hæc à duobus haud vulgaris ingenii viris animad-
 verterentur, ipsumque Phænomenon eorum prorsus & in-
 usitatum videretur, incessit animum cupido quærendi,
 quanam istius foret causa. Proinde Literas ad clarissimum
D. Doctorem Newton superius laudatum dedi; qui, quid
 Ipse, quid item Amici super hæc re observaverunt, mense
 Octobri 1706, rescribere haud dedignatus est.

Narrat autem quod in itinere à *Dononiâ*, *Florentianæ*
 versus, Bombardarum exoneratarum strepitum ad *S. Mi-*
chaelis in Bosco urbem (in *Beroniæ* vicinâ) exaudiverit,
 quæ tamen Bombardæ *Mirandula* displœæ ad 40 millia
 passuum distabant; quem locum *Gallorum* acies obsiaione
 tum cinxit. Ac nocte insequenti eundem Sonum, cum
 in *Appenninis* pernoctaret (20 millia passuum longius re-
 motus) exaudiverit.

Observationes vero & Experimenta quæ idem Vir insignissimum, pro sua humanitate & benevolentia ab aliis fieri curavit, specialem quendam locum, gratiasque maximas ob hæc beneficia quæ illius Dignitas in me contulit, merito sibi vendicant.

Cum nostras Literas *Florentiæ* acceperit, Nobili cuidam, eidemque Philosopho eminenti quid vellemus aperuit: qui deinceps hæc Vota nostra *Magno Duci* nota fecit. “Idem
“ verò *Magnus Dux* (tu inquit) pro suo singulari Artium
“ & Doctrinæ Studiorum amore, & in eorum Cultores benignâ indulgentiâ, quæ una cum Sceptro à Majoribus
“ tradita accepit) Experimenta statim fieri iussit, unde
“ mihi plenè de hac re satifieret: *Josephumque Averrann.*
inclytum *Pise* Philosophum, & politioris cujuscunque Artis peritum, hisce Experimentis inspicendis & dirigendis præfecit. Cujus honoratissimi Viri Narrationem *Honoratissimus Ablegatus* mihi iussu perscribere dignatus est. Suam matrem verò huc redit, viz.

Postquam plurima non minùs cautè quam ingeniosè præfatus esset, quæ magnam in Sonorum progressu differentiam excitare potuissent; tandem refert, “ Quòd in
“ hac infericri *Florentiæ* arce, Bombarda *Colubrina* inter
“ horas primam & tertiam Noctis crebrò displodebatur;
“ Virique quidam *Ligurni* asservabantur, qui diligenter
“ observare iussi sunt, an ejusdem crepitum exaudire possent. Quorum nonnulli qui ad *Lanternam*, & *Marzocco*
“ positi erant, nullum audiebant, (fortè quia Maris fremitus Sonum infuscabat:) alii vero qui stabant super
“ *Veteris Arcis* munimenta (quæ *Donjon* appellant) quique
“ ad *Montem Rotondo* dictum (qui quinque circiter milliaria à *Ligurno* abest versus *Montem Nero*) missi, auribus exceperunt. Et quotiescunque exonerabatur, toties ejus fragor iisdem in locis clarè exauditus est. Hujus
“ autem *Arcis Florentinæ* distantia à *Monte Rotondo* rectâ
“ lineâ vix minor 55 milliaribus censetur. Et notatu
“ dignum est, quòd interjacentia rura plerisque collibus
“ obstita

obſita ſunt, qui paulò impediti rem Soni vram reddant neceſſe eſt. His accedit, quòd eodem veſpere ventus quidam Occidentalis leniter ſpirabat, qui (cùm *Ligurnus* ſicus ſit ad Libonotum reſpectu *Florentiæ*) liberiorum Soni expansionem aliquatenus præpedire mentò creditur.

Quo autem locus apertus & undique patens haberetur, ſeligetur tractus ille Maris qui *Ligurnam* & *Portum Ferrai* dictum, int' iacet, cujus diſtantiæ ſecundum perit ſſimorum Nautarum calculum 60 milliarium eſſe deprehenditur. Tormentorum autem militarium fragor à *Ligurno* ad portum *Portum Ferrai*, locaque vicina hand rarò perire ſolent. Nec aſpirantium Ventorum auxilio opus eſt, ad promouendum nuncce Soni progream, quo nempe exaudiat. Imò verò ventus qui liber, ſive ſit ſecundus, ſive adverſus, eidem impimento eſt, ipſumque Sonum nunc ſonorum reddit: fortean quia Maris hinc agitati fremitus magis obſeſt, quam Aeris eodem conſuētis curſus prodeſt. Proinde tunc ſolùm exaudiat Sonus, cum Ventus prorsus ſilet, vel tantùm leniſſimè ſuſurrat, cum Aer ſerenus eſt, & Mare tranquillum. Neque tum quidem ab omnibus locis inſcriminatim exaudiat, ſed ab iis ſolis quæ paulò eminentius ſita ſunt; cuiuſmodi ſunt duo iſta Propugnacula, quæ *Stella* & *Fulcon* nominantur & Locus *Mulini* dictus. Præterea requiri ut ut ipſe Obſervator quàm attentiffimum ſe præbeat, nec ullà obſtrepentium voce aut clamore impediatur, & intertetur. Tum verò interdum æquè ac noctu (modo Atmosphæra ſit ſerena & tranquilla) exaudiat; niſi quod nocturno tempore fortior & acutior aliquantò videtur ut Sonus, cum nulli occurrant Strepitus, qui luci ſæpius aures offendere ſoleat.

Porro nobis nunciatum fuit à Teſtibus fide digniſſimis, quòd pluribus abhinc annis, cùm graſſaretur *Seditio Meſſanenſis*, ipſaque Urbs obſidione premebatur,

“ Tor-

“ Tormentorum bellicorum fragor *Augustæ & Syracusæ*
 “ *horum* Incolarum aures percelleret.

“ Item cùm *Galli* Tormentis muralibus *Genuanæ* concu-
 “ terent, constat quòd eorundem crepitus ad *Montem* usque
 “ *Nigrum*, qui *Ligurno* supereminet, pertigerit.

“ Ex hisce Observationibus proclives sumus ad creden-
 “ dum nullum esse super hâc re discrimen inter *Italiam &*
 “ *Plagas Boreales*.

“ Quod autem ad alterum Quæsitum attinet ; utrum
 “ Ventus directè vel adverse spirans, Sonum accelerat vel
 “ retardat ? Eidem hætenus certò responderi haud po-
 “ test. Neque enim ipsa quæ adhibuimus Experimenta,
 “ quibus veritatem indagatam fore speravimus, Quæstioni
 “ dirimendæ sufficiunt. Quippe æstivo tempore (quo
 “ plerumque interdium venti spirant à Mari, & Occidente ;
 “ cum autem advesperascit, filere solent) defuere nobis
 “ commodissimæ occasionēs hanc rem sæpius & certius
 “ experiundi. Speramus tamen, inclinante Anno,
 “ postquam alia successerit Tempestas, opportunio-
 “ ra nasci tempora, quibus hujusmodi Experimen-
 “ ta felicius & iteratò, & cum majori *dispendio* institui
 “ & comprobari possint. Impræsentiarum autem re-
 “ ferre sufficiat quid nobis evenerit 10 Augusti po-
 “ stre mò elapsi, cùm quæ sequuntur experimenta capere
 “ licuerit.

“ *Colcurina* quædam (60) super Cortinam inferioris
 “ Propugnaculi *Florentiæ* adducebatur, ibique sic posita
 “ ut Os ejusdem versus *Artemino* spectaret (quod est Ru-
 “ sticanum *Magni Helviriæ Ducis* Palatium, Colle quo-
 “ dam altiore situm, prædictique Propugnaculi latus Oc-
 “ cidentale respiciens, à quo etiam circiter 12 millia pas-
 “ suum distat.) Diem quendam selegimus cùm Ventus
 “ occidentalis aliquantò fortius spiraret, ut Soni motus
 “ contrario vento repelleretur. Hoc autem parum juva-
 “ bat : quippe sub vesperam, cælum omnino tranquillum
 “ erat, vel saltem adeo tenui aurâ agitabatur, ut candelæ
 “ flammam

“ flammam haud disjiceret. Hic Loci relictis qui usque
 “ hanc rerum peritis, quibus antea quæ potissimum si cu-
 “ rarent in mandatis dedimus, ad prædictum *Palatium*
 “ *Artemino* concessimus, quo *Honoratissimus Ablegatus* ad-
 “ esse voluerit. Prout iussimus, inter Horas primam &
 “ tertiam Noctis, *Colubrinas* sæpius exonerata est; & 49
 “ Secunda Minuta inter ejusdem Coruscationem & Frago-
 “ rem jugiter numeravimus. Nos etiam in *Artemino* Bom-
 “ bardas quasdam accendimus; atque inter hanc corus-
 “ cationem & fragorem prædicti Spectatores (quos in
 “ Arce reliquimus) tantum 48 Minuta Secunda numeri-
 “ verunt. Unde constabat Sonum unius tantum intervalli
 “ Secundi intervallo velocius ab *Artemino* ad *Florentiam*,
 “ quam retrorsum ferri.

“ Haud adeo nostræ observationi confidimus, ut minu-
 “ tulum hoc Velocitatis discrimen ad Venti conspirantis
 “ aut renitentis vim referre audeamus. Quippe ipsius Ob-
 “ servatoris error, qui Penduli vibrationes numerabat,
 “ huic fortean occasionem dederit. Quid sanè facile fieri
 “ possit. Sæpius enim eveniat necesse est ut emicantem
 “ flammam non nisi post inceptam Penduli Vibrationem
 “ videat, Sonitûsque fragorem nondum terminatâ Vibra-
 “ tione exaudiat: adeo ut ipse Calculum unâ Vibratione
 “ auctiorem, quam par est, hoc pacto faciat, dum inte-
 “ rea Temporis spatium sit utrinque par & idem.

“ Sperabamus autem proximo mane Ventum fortè con-
 “ trarium exoriturum, (Sæpius enim hic loci, primo sal-
 “ tem diluculo, Ventus ab Oriente spirare solet) qui in-
 “ ceptis Experimentis magis inserviret. *Colubrinas* igitur
 “ rursus, cum illuxerit Dies, exonerari iusseramus: Ven-
 “ tus autem nec Voris nec Operi favebat; quippe qui pau-
 “ lulum tantum ad Borealem plagam se convertisset. Adeo
 “ ut variatio Temporis, & Velocitatis Soni, in tantilli
 “ Venti mutatione, vix perciperetur. Solitas proinde 49
 “ Penduli Vibrationes, ut prius, numerabamus. Inter-
 “ rea temporis hæc eadem Experimenta expendere spera-

mus, quamprimum tempestas magis idonea occurret,
 " Ventorumque crebriores mutationes, commodiores occa-
 " siones dabunt eadem melius experiendi, unde tandem
 " plenissimè nobis satietur.

Quod ad Spatium attinet, quod Soni quovis assignato
 tempore percurrunt, de eodem nondum inter se constat;
 sed ab experimentis quibusdam coniciebant rem ita se ha-
 bere, prout *Experimenta Academia del Cimento* testa-
 bantur.

Hactenus Vir iste acutus & solers superiùs laudatus.

Ex cuius Observationibus, unà cum iis quas Honora-
 tissimus Insignissimisque *Legatus* nobiscum communicavit,
 abundè patet, Multò longius exaudiri posse Sonos in *Italia*,
 quàm prædictus Amicus ingeniosus nos docuit. Ipse enim
 eximius *Ablegatus* Bombardarum ingentium strepitum ad
 60 Milliarium distantiam auribus percepit. Quæ etiam
 ejusdem suasu *Florentiæ* exonerabantur, eadem 55 Millia
 passuum audiebantur. Tormenta militaria *Ligurni* dis-
 plosa ad 60 Milliarium intervallum aures feriebant. Quæ
Messanæ exonerabantur (ut ex Tabulis Geographicis pa-
 tet) eorem aures, qui centum fere Italica Milliaria semoti
 sunt, percellabant. Quæ denique in concutiendâ *Genui*
 displosa sunt, eorundem fragor plus quam 90 Millia pas-
 suum Italicorum (ut ex Mappis) pervenit.

Quibus omnibus in mentem revocatis, & seriò perpen-
 sis, vix possum quin credam non minus latè propagari
 Sonos in omnibus *Meridionalibus*, quàm in hisce *Borealibus*
 Terrarum plagis. Quamvis haud defunt exempla longio-
 ris Sonorum progressûs in quibusdam Septentrionalibus
 Terræ partibus. Generosus quidam *Danus* (insignissimi
 nostri *Danici Principis* Famulus) mihi inter confabulandum
 narravit se, cum in *Daniâ* vitam ageret, Bombardarum
Carolsroomiæ displosarum crepitum, 80 Milliarum Anglica-
 na (ni fallit memoria) remotum clarè exaudivisse. Vir
 item peritissimus *Doctor Hearn* (illustrissimi Regis *Sueciæ*
 Medicus) narrationem quandam ad *Regalem* nostram So-
 cietatem

cietatem misit, de Bombardis *Holmic* explosis, cum eaq; re
 unicus ex regis Principibus celebrarentur, A. D. 1685,
 quorum fragor 30 Suevorum Milliarium intercapadonem
 percurrit, quæ 180 Millia Anglicana ferè exæquatur.
 Nav. li etiam ibi Pugna quæ gesta est *Anglicum* inter & *Hol-*
landicum A. D. 1672. Tormentorum bellicorum Strepitus
 plus quàm ducentis Milliaribus interjacentium attonitas
 aures percussit; quippe qui trans *Insulam* *Costam* ad *Sal-*
opianam usque & *Walliam* pertingebat.

Quod proinde ambo Fratres *Townseii* observârunt, idem
 prædicto *Castello S. Angelo*, vel *Romæ* saltem, proprium
 omnino est, & peculiare. Neque enim perspicax eorum-
 dem ingenium, fidamve curam malè suspicari licet. Ista
 igitur Soni diminutio, quam idem animadvertēbant (nisi
 malè auctoror) vel ad prædicti Castellii Situm, vel ad in-
 terjacentes Domos (pessimè & ubique in istâ conterusimâ
 Urbe surgentes) vel ad Strepitus ejusdem uadique perfor-
 nantes, vel ad Ventos adversos, vel demum alium consi-
 milem causam referendum est: Quam is feliciori con-
 jecturâ assequendam relinquo, quibus isti loci visibilis contig-
 git. Vel forsitan hi Viri prædictas suas Observationes te-
 cerunt eo Aeris statu, quo Soni, quamvis maximè secu-
 dos habeant Ventos, multò tamen languidiores sunt, quam
 aliis temporibus, cum prorsus adversi sunt. Et quondam
 persuasum me habui, quod ejusmodi Aeris temperies *Romæ*
 semper occurrit, & non in aliis *Italiæ* partibus; do-
 nec in contrariâ n. *Kircheri* sententiam incidi: qui dicit,
 “ Hic *Romæ*, mirum dictu, Spirante *Boreâ*, maximum vi-
 ‘ gorem acquirit [Echo vel Sonus;] *Austro* flaccescit;
 “ *Euro* & *Subsolano* mediocriter se habet.

Hanc autem Aeris temperiem, quoniam Sonos adeo ^{phorur, ubi}
 afficit, haud abs re erit speciatim considerare. De eadem ^{supra.}
 igitur proximo loco fusius differrere, quæque super ea Ob-
 servationes fieri, proponere, in animo est.

§. 13. De variis Sonorum Remissione & Intensione (sive
 Audibilitate) per diverso Atmosphæra statu.

Sæpius *Hæstæ*, cùm jam incaluerit aer, observavi Sonos
 supra modum languidiores videri, debilesque admodum
 ad aures terri; cùm aliâ tempestate, præsertim *Flyene*, si
 forte gelascit, multò magis argutos & stridulos eosdem
 fuisse, fortiusque aures perculisse. Spirante etiam *Boreæ*
 vel *Euro* (quantumvis adverse) Sonos clarioris, magisque
 stridulos esse sensi, quam si ex contrariis plagis Venti spi-
 rant; ut *Kircherus* quoque *Romæ* observavit. Hoc
 autem non constans & perpetuum est.

Neque quid magis certum ex *Mercurii* in *Barometro* a-
 scendentis vel descendente inspectione colligerem, quod
 tamen credulus autumabam. Sonos enim aliquando max-
 imè claros & argutos, aliquando maximè debiles & lan-
 guidos cùm ad summum ascenderet; è contra aliquando
 maximè stridulos, interdum maximè deficientes, cum *Mer-
 curius* ad imum descenderet, comperi.

Pariter etiam incertè se res habet quoad Serenum & Ne-
 bulosum aerem. Tempore pluvioso & humido sæpè ob-
 servavi Sonos obtundi, & "Post imbres vehementiores
 " plurimàm virium acquirere, ut *Kircherus Romæ*. Sed
 contrarium quoque sæpe evenit. Maii 31. A. D. 1705.
 Aer hîc loci magis serenus, Vaporumque expers fuit, quam
 unquam antea me vidisse memini. Tam purum etenim
 liquidòque serenum erat Coelum, ut objecta longissimè re-
 mota clarè facilèque prospicerem. Sed tamen Bombardas
 in agro *Blackheath* tunc temporis explosas exaudire non
 potui (si unam excipis, cujus fragorem jam prorsus lan-
 guentem auribus perceperim) quamvis omnium eminèns
 micantem flammulam clarè cernerem. Eodemque tem-
 pore Nubium & Venti motus cum sono conspirabat; Au-
 ra etiam lenissima tunc spirabat, quæ compositos crines
 vix moveret; & omnia denique ad Soni vim motumque pro-

promovendum necessaria concurrere videbantur. Contra vero, cum profus mutatus fuerit Aeris & Caeli status, cum omnia turbida viderentur, & Atmosphæra vaporibus plena, sæpe stridulos Sonos, nec minùs crebrò eosdem hebetes & renissios exaudiri.

Causas harum Variarum allic inquirendas relinquo, quoniam nostri ingenii caput eas equè superare fateor, ac assignare quid sit proprium Soni Medium, sive Vehiculum; an ætherea & subtilior, an vaporosa & crassior Atmosphære pars, sive ambæ simul?

Quod autem *Nebrias* *visissæ* spectat, easdem certum est Sonos quam maxime habere. Soni enim tunc admodum languidi & obusti plerumque videntur. Quod ab interpositis vaporibus, & spissis particulis, quæ Nebulam constituunt, certissimè provenit.

Idem etiam de *Nivoso Cælo* observavi. Cum enim Nix recens in terram decidit, protinus hebescent Soni. Cum verò glaciata fuerit eius superficies, Soni repentinè acutiores fiunt, Campanæque & Bombardas tinnientes & reboantes eo aliq̃ exaudiri, ac si Nix humum non consperserat. *Tomleius* amicus noster oradiscus haud ita pridem se observasse aiebat (cui non assimile egomet expertus sum) dum per oppidum quoddam equo veteretur, Campanarum (quæ tum haud ita procul pulsabantur) Sonum ad aures vix posse pervenire, si quando Dominus Nive tecta occurreret interjacens. Adeo ut ipse, oppidulum ingressus, plurimum miratus sit, Campanas tam si libè Cære, dum primas interjectas ædes præteriret, duntaxat repentinè resonare, cum proximum vicum intra domum penetraret. Quod quidem per totum viæ cursum in coniecto oppido observavit, Campanarum nempe Sonum ad aures perungere, vel non, prout ædificia nive obstita occurrerent interposita, vel non.

Sed de his plus quam satis. Ad alia iam maioris momenti descendimus.

§. 11. De Ventorum vi, sive influentiâ in Sonum.

Illustrissima *Academia del Cimento* ab experientia venit Sonorum motum nec ab adversis Ventis retardari, nec à secundis accelerari : Sed utcumque spiraret Ventus, semper idem Spatium in eodem tempore percurrere. In istâ sententiâ fuit *Gassendus*, cæterique ferè omnes qui antea vel postea Philosophati sunt.

Quoniam verò contrarium hujus patet ab ipsâ Experimentiâ, erroris coarguendi sunt. In quem ideo incidisse videntur, quòd ad nimis breve intervallum Experimenta sua instituerentur. Omnino enim verisimile est hosce Philosophos ad unius tantum, vel ad summum, duorum, triumve Milliarium distantiam observationes suas fecisse. Quas proinde vitiosas esse haud miror. Sin autem ad 10 aut 12 Millia passuum, accuratis Instrumentis adhibitis, rem tentassent (quod ipse sæpius feci) errorem facile agnoscerent.

Quem communem errorem Egomet (horum Virorum autoritate fretus) diu admisi; donec tandem Bombardarum in agro *Blackbeath* observatione triennali, & amplius, eundem feliciter detexi. Cum autem primum Sonos aliquando citius, aliquando tardius ad aures perigisse sensi, erroris cujusdam à me facti suspicio animum subiit, vel quòd Automati vibrationes minus rectè numeravi, vel coruscantem Bombardæ flammulam malè observavi; vel in alium consimilem errorem haud attentus inciderim. Postquam verò Bombardæ de industriâ in mei gratiam exonerarentur singulis semihoris, ab horâ sextâ vespertinâ usque ad mediam noctem, Sonumque perpetuò sine ullâ notabili varietate, 120 vel 122 semiscundorum spatio pervenire sensi, quamvis Ventus directè adversus fuisset; aliis autem temporibus, cum Ventus secundus spiraret, sive è directo, sive ex transverso, aut obliquo, earundem Bombardarum Sonum 111, 112, 113, 114, 115, 116 vel ad summum

sumum 117 Semifecundorum spatio advenire deprehendi; tam dumum me certissimè persuasum habui, reale aliquod discrimen fuisse, quod istam in Observationibus varietatem p p risset.

Neque solùm *Secundi* aut *Adversi Venti Sonorum motum accelerant aut tardant*, sed etiam *pro graduum varietate, quæ vehementius aut lenius spirant, ei magis minusve eundem promovere aut impediunt*. De quibus omnibus in majorem certi adinervi, speciales quasdam observationes in sequenti Tabella subnectam; postquam prænotavi Bombardas in agro *Blackbeath* circiter 60 gradus à Meridie distare, hoc est ad Plagam à S W b W aliquantò remotiorem vergere.

Tabella Sonorum Bombardarum in Agro Balaclavensi, pro
Venorum, Viriumque qui us agitantur, varietate.

Dies Mensis & Anni.	Horæ Diei.	Nume- rus Vi- brat o- nium.	Vento- rum Pla- ga.	Nubium Plaga.	Altitu- do.
1704.					
Febr. 13	6 h. ad med noc.	120 122	NE b E	NE b E	29 99
11	11 ½ mane	119	E 2	E	30 22
1705.					
Mar. 30	10 mane	113	S W 7	S W	29 30
Apr. 2	8 ½ p. M.	114 ½	S b W 1		
3					
3	10 mane	116 ½	S 4	Inferior S Sup. W b N	29 80
5	1 p. M.	111	SW b W 7	S W b W	29 70
13	8 ½ mane	120	N b E 2		29 26
24	5 p. M.	116	SW b W 0	N W	29 59
Sept. 11	6 ½ p. M.	115	W 2	W b N	Saker.
	7 p. M.	115 ½	W b N 2		Mortar.
29	10 ½ mane	112	SS W 6	SS W	29 38
Octob. 6	10 mane	117	ESE 1 & 2	SE	29 34
Nov. 30	meridie	115	SS W 4	SS W	29 10
Febr. 15	11 mane	116	S b W 1	SW	29 60
1706.					
Nov. 29	11 ½ mane	116	S W 0	SW b W	30 06
	meridie	118	SW b S 1		
Febr. 7	meridie	112	SW b W 4	W	29 83

Ex quamplurimis aliis has Observationes selegi; omnes cautè factas, singulas nimirum bis, ter, aut sæpius repetitas. Adeo ut de veritate eorum quæ supra diximus, luculentè & indubitatè constet. Ita ab Experimentis Ap 5. & Sept. 29. factis, patet Ventos vehementiores urgere & maturare Sonorum motum. Quinto enigm Aprilis, cum prope conspiraret Venti Sonique motus, fortior etiam aliquantò idem Ventus fuerit (prout figura [7] annexa denotat, pariter ac Cifra [10] tranquillum Cœlum; & Figuræ 1, 2, 3, 4, &c. varias Ventorum vires significante) tunc temporis, inquam, Sonus III Semisecundorum spatium iter confecit. Aprilis autem 24, cum Ventus ab eadem Plagâ spiraret, & Aer tranquillus esset, idem itineris spatium non nisi 116 Semi-secundorum intervallo Sonus peragrasset. Ita etiam Feb. 7. 1706, cum ab eodem Cardine spiraret Ventus, & secum deferret Sonum, viribus autem jam dimidio minoribus, 113 Semi-secunda elapsa sunt priusquam Sonus assuetum confecit iter. Ita demum Sept. 29. 1705. Vento vehementiore spirante, & minus secundo, Sonus intra 112 Semi-secunda progressum absolvit. Ex quibus, aliisque in Tabellâ exemplis liquidè constat, *Ventos Fortiores Soni propagationem adjuvare, Leniores autem eandem minus promovere.*

Idem etiam constat de iis Ventis, sive Aeris torrentibus, qui Soni progressui è directo favent, vel obstant; eos nimirum *eiusdem motum celeriores vel tardiores reddere.* Quique *Intermedii*volvuntur Atmosphæræ fluxus, eos *Intermedium* pariter Soni progressum, sive Penduli Vibrationum numerum efficere.

Maximum disformen, quod in Soni progressu per 13 fere milliarium spatium hætenus animadverti, novem circiter aut decem Semisecunda exæquat, cum nempe Venti fortes promoveant, & lenes tantum impediunt Sonum. Cum verò lenes solam aut prorsus nulli obstant, vel adjuvant eundem, tum quidem differentia duo vel tria Semisecunda haud superat.

Postquam hoc pacto, quas vires habuerint Venti, cum ad accelerandum, tum ad morandum Sonorum cursum, perspexerim, ipsorum tandem Ventorum Velocitatem quærere curiositas me duxit. Quod utut alienum, non tamen prorsus ingratum curiosis videbitur, uti spero, si quasdam super hâc re Observationes in medium proferam.

§. 12. *De Ventorum Velocitate.*

Ut quantum spatium quovis assignato tempore perflent Venti pro certo scirem, leviuscula quædam corpora in parandis experimentis adhibui. Cujusmodi sunt Pappus, Plumæ leves, &c. quæ proposito melius inservire videbantur, quàm Instrumentum illud quod in *Actis Philosophicis*, No. 24. descriptum habemus; vel etiam illud alterum magis commodum Molæ alatæ figuram referens, ab acutissimo D. *Doctore Hook* nupero Amico, ni fallor, excogitatum.

Ex plurimis quæ feci experimentis, leviusculorum corporum ope, cum variæ Ventorum vires fuerint, deprehendi, Ventum vehementissimum vix 60 Millia passuum horæ spatio percurrere. Exempli gratiâ; Aug. 11. 1705. tantam Procellam excitavit Venti vehementiâ, ut ipsam Molam Pneumaticam, juxta locum quo observationes meas feci, pene subverteret. [Ventorum Vires (uti modo diximus) hisce Characteribus plerumque notavi; 0, 1, 2, 3, 4, 5, 6, usque ad 10, 15, aut plures gradus.] Prædicti autem Venti vires 12 circiter aut 14 graduum horum respondere æstimavi: & à quamplurimis iteratis experimentis animadverti, Turbinem istum circiter 33 pedes, spatio Semi-secundi Minuti percurrere, sive 45 Milliaria in Horâ. Unde colligo Ventum concitatissimum & maximè nimbosum (illo vehementissimo, qui Mense Novembris 1703 furebat, haud excepto) non plus quam 50 aut 60 millia passuum horæ spatio prætervolare.

Postquam

Postquam rapidorum Ventorum Velocitatem dimensum sumus, quæ sit minùs rapidorum celeritas conjicere haud difficile est. Horum enim cursus pariter notavi, variisque ab Experimentis edoctus sum, horum nonnullos 15, quosdam 13, alios multò plura, aliosque multò pauciora miliaria horæ spatio conficere : quosdam autem tam lento motu ferri, ut vix unum milliare in horâ peragrent. Alii porro Venti sunt adeo tardigradi, ut eosdem aliquis, equo vel pedibus iter faciens, facilè prævertat. Quod Sensibus patet ; quoties gradum sistimus, lenem auram nos placidè ventilantem percipimus : si autem cum eodem pergimus, nullam prorsus sentimus : si verò celerius pedem movemus, comitantis & conspirantis Auræ loco, adversantem, & in ora vultusque spirantem aerem persentimus. Ita, quiescente prorsus Atmosphærà, & stagnante, si forte ambulamus, aut equitamus, lenem Auram nos tunc prementem sentimus, tantarum nempe virium, quantæ motui quo ferimur respondent. Eodemque Motûs gradu, siue Velocitate, fertur Venti aura, siue Aeris fluxus, cum pari impetu nos morantes aut cessantes premat.

Ex hisce Observationibus circa *Velocitatem Ventorum*, plurima haud inutilia notare licet. Speciatim verò rationem unam assignare quare *Mercurius* tam diu ascendit & descendit, priusquam Sudum Cœlum, vel Pluvia infequitur.

Hæc autem tanquam à proposito aliena omittam ; solumque hoc unum quoad Sonos observabo : nempe, cum eorum Motus Vento celerior sit, patet quòd istæ Atmosphære partes quibus imprimuntur, aut deferuntur Soni, non sunt eadem ac illæ ex quibus conflantur Venti, sed quædam aliæ magis æthereæ & volatiles, quantum divinare licet. *Venti* enim celerrimi haud plus quam 60 miliaria Horæ spatio prætervolant : *Soni* verò plus quam 700 millia passuum eodem tempore percurrunt.

Sin autem obijciatur quoddam Venti Sonos celeriores aut tardiores reddunt: Responderetur; Hoc non à solo proprioque ventosarum particularum fluxu, seu tendentiâ proficisci, sed potius ab omnium Atmosphæræ particularum, cum crassiorum, tum ætherearum conjuncto & conspirante motu. Quæ Cursus, sive Motus directio, si Sonorum Undulationibus faveat, Sonorum appulsus exinde accelerari; sin adveseretur, retardari, omnino verisimile est.

§. 13. *De Sonorum Velocitate.*

Postquam Ventorum operationes & effectus in Sonorum progressum hoc pacto exposuimus, & de Velocitate Sonorum generatim tantum quædam diximus; superest tandem, ut specialiores quas feci observationes super hac retradam.

- Ex dictis proinde, aliisque quamplurimis quæ prænotavimus, firmissimè concludo, Sonos hoc Velocitatis gradu propagari, Nempe, ad *Milliaris intervallum* (sive 5280 *Pedum Anglicanorum*) *spatio* $9\frac{1}{4}$ *Semi secundorum* percurrere: Vel (quod eodem redit) Pedes 571 unius Semi-secundi, vel 1142 Pedes unius Secundi Minuti Temporis spatio.

Hoc autem prædictum spatium pertranseunt Soni, si transversus Atmosphæræ fluxus intercurreret, & est *Medius eorum Progressus* sive *Motus*. Sin autem Ventus Soni rapiditatem augeat, possibile est ut plusquam 600 Pedes Semi-secundi spatio prætereat. Vel è contra, si moram ei innectat, haud plus quam 560 Pedes eodem temporis intervallo progrediatur.

Ira tandem Historiolam nostram ad finem perduxì, summam complectentem præcipuas quas feci Observationes circa Sonorum Progressum, & quorundam aliorum eum spectantium. Quam quidem Expositionem solertes & ingeniosi viri in plurimos, nec contemnendos usus haud difficulter convertant. Speciatim vero, prædictæ Observationes,

vationes, & Experimenta non parùm conducere videntur,

1. *Philosopho* ; qui vel hinc aliqua ex parte instructior sit ad arcanam Sonorum Naturam investigandam ; & eorundem plurima Phænomena abstrusa explicanda.

2. *Nautæ* ; qui hinc discat quanto intervallo absunt Naves, quas procul fluctuantes, vel ad anchoras stantes cernit : quam longè item Tellus, aut optata Arena, eminè conspecta, distat. Quæ ex Scloppetis de industria explosis, signo quodam dato, facilè certòque innotescant.

3. *Militi* : ad inveniendum quam procul Hostis Castra locavit, ad quam distantiam sita est Urbs obsessa, Arx, Armamentarium, &c. ad Tormenta muralia libranda, & dirigendos Pyrobolos, glandesque ignivomas.

4. *Geographo* : ad Locorum distantias facilius & certius mensurandas. Quivis enim intra horam unam aut alteram, parvâ pulveris pyrii copiâ instructus, totam fere Regionem Tabulâ accuratissimè descriptam hoc pacto exhibeat. Scloppeta enim dispersa Distantias (prout diximus) ostendent : & quodvis Instrumentum Mathematicum quo metiuntur Angulos, vel Instrumentum illud vulgare quo Decempedatores utuntur (*the Plain Table* vocatum,) vel sola Regula Pinaculis instructa, variorum locorum Situs indicabit ; quæ deinde delineare haud difficile est.

Hæc etiam ratione in Mapparum rectitudinem, & veritatem quis facilè inquirat ; & si quos habeant errores, corrigat.

Hæc demum (Sonis) observandi ratio, Locorum intercessorum, præsertim verò latissimorum Fluviorum, & modis

modi locorum haud aliter mensurabilium, distantis dime-
tiendis magnopere inserviat.

In cujus rei specimen, mecum statui (amicorum ope)
distantias quorundam Sinuum & Fretorum celebriorum
comparare; speciatim *Freti Gaditani*, *Tingitanos* inter &
Gebraltariam; & *Britannici*, inter *Dubridem Angliæ* &
Caletum Galliæ; cujus Freti latitudo secundum *Gallorum*
ingeniosorum mensuram est 22.7 milliaria Anglicana. Sed
hisce, aliisque rei literariæ promovendæ conatibus lugu-
bria hæc Belli tempora obstiterunt.

Du Hamel
Hist. Acad.
Reg.

5. *Echometra*. De hoc ludicro & jucundo Soni Phæ-
nomeno (scil. *Echo*) licet plurimi docti viri olim & postea
sollicitè quæsierint, de plurimis tamen ad idem spectan-
tibus non benè inter se convenit: speciatim de spatio Loci
ad repetitionem 1, 2, 3 vel plurium Syllabarum necessario;
vel (quod eidem redit) de spatio ab *Echo* peregrato in
certo quodam temporis intervallo. *Mersennus* . . . :
passus ad Vocem Monosyllabam repetendam concedit;
Blancanus 24 passus (cui astipulatur nostras celeberrimus
Dr. *Plot.*) sed *Ash. Kircherus* asserit nihil omnino certi
de eo definiri posse, quòd nempe Ventorum variatio, vi-
riumque Soni intensio & remissio, & multa alia immensam
variationem pariunt.

Rationem autem hujus dissensûs inter laudatos hosce
viros reddere haud difficile est. Ex plurimis enim causis
oriri potest; ex tarditate nimirum & diversâ nostrorum
Sensuum dispositione; vel ex variâ Sonorum audibilitate;
ex Syllabarum ipsarum gravi vel acuto sono, sive earun-
dem contractâ vel productâ pronuntiatione; vel ex quâ-
libet aliâ causâ temporis intervallum protrahente. Nullus
enim dubito (Exempli gratiâ) quin si Objectum aliquod
Phonocampticum repercutere potuerit omnes Syllabas hu-
jusce sequentis carminis, viz.

Vocalis Nympha, quæ nec reticere loquenti,

Quod

Quòd haud valeret repercutere omnes Syllabas sequentis carminis, quoniam paulò productior est ejus pronuntiatio, Scilicet.

Corpus adhuc Echo, non Vox erat, & tamen usum :

Et multò minùs repetere valeret asperas omnes, & productas Syllabas sequentis hujus carminis, licèt numero pauciores, viz.

Arx, tridens, rostris, sphinx, præster, torrida, seps, strix.

Verùm à præcedentibus de Soni motu Observationibus concludere licet, Quòd, uti Soni, ita ἤχῃ certa & determinata spatia in certo quodam præscriptoque tempore percurrunt. Quod ipsum ab experientià sæpiùs edoctus sum, scilicet, Echo redire in duplo temporis intervallo, quo Vox Primaria Objectum Phonocampticum pertingebat. Exempli gratià : Si Objectum Phonocampticum Stadium distaret; Echùs regressus in eodem temporis intervallo fuerit, in quo Primarius Sonus duo Stadia percurrisset, si non percussus fuisset.

Et hoc in dimetiendis Locorum distantis magno mihi usui sæpè fuit. Exempli gratià : Cùm in *Thamesis* fluvii ripà starem, Villæ *Woolwich* oppositâ, monosyllabæ Vocis *Echo* à Domibus adversis repercussa fuit in sex Semisecundis Minutis temporis. Unde colligo Latitudinem fluvii *Thamesis*, eo loci, à margine unius Ripæ ad marginem alterius, 1712 pedes Anglicanos esse, sive supra quadrantem milliariis. Nam ut 9,25 (Semisecunda) : ad 5280 (pedes in milliari uno) :: Ita 6 (Semisecunda) : ad 3424,8 pedes. Cujus dimidium est 1712,4 pedes.

5. Denique hoc pacto *Intonantium Nubium Altitudo*, & ipsius *Tonitru*, *Fulguris*que Distantia faciliè innotescant.

II. *Account of the strange Effluvia* which happened at Mrs. C. New-Forge, in the County of Down in Ireland, on the 9th of August 1755. Communicated by Samuel Molyneux Esq; to the Philosophical Society, at Dublin.

WHEN I went to visit Mrs. Gendervoine, a Fortunate Lady, who has all the Fortunes of this Excellent County, she then told me That the whole Day was Calm, & still, dry, like or no Wind stirring until towards Evening; That there was a small breeze with falling Rain, which lasted about an Hour. That at the end of the night, after Sunset, she saw several faint flashes of Lightning, and heard some Thunder Claps, as at a distance; That at seven and eleven o'clock both were very violent, and the rain so increased and continued more from seven to twelve o'clock, that she was obliged to leave her Chamber, and came down at the time the shower and more dreadful than all the rest, which, as she thought, shook and inflamed the whole House; and being sensible at that instant of a violent strong Sulphureous Smell in her Chamber, when she did not perceive before now, and feeling much gross Dust falling on her Hands and Face, she lay in Bed, she concluded nothing but that part of her House was thrown down by the Thunder, or set on Fire by the Lightning; That arising in this Fright, she called up her Family, and

Candles

Candles being lighted, she found her Bed Chamber full of Smoke and Dust, as also the Kitchen that was next to it. The rest of the House being safe, she was not so much concerned at that time about any other damage she might have sustained, more than that she observed the Looking glass, that hung in her Chamber, to be broken.

The next day again she found upon further search and inquiry, that part of the Top or Cornice of the Chimney, which stood without that Gable-end of the House where her Chamber was, was struck off; That part of the Coping of the Splay of the Gable end itself was broken down, and the Shingles on the Roof adjoining thereto (to the number of 12 or 16) were raised or rustled, but none shatter'd or carry'd away; That part of the Ceiling in her Chamber beneath those Shingles was forced down, and part of the Plaster and Pinning Stones of the adjoining Wall, was also broken off and loosened, (the whole Breach 16 or 20 inches broad.) That at this place there was left on the Wall a smutted Star or Trace, as if made black by the Smoke of a Candle, which was directed downwards towards another place on the same Wall whereon a Breach was also made as the former, and of the same Dimensions, part of which was behind the place where the Looking-glass did hang; That the Boards on the back of a large hair Trunk full of Table and other Linnen, standing beneath the Looking-Glass, were forced in, and splinter'd as if by the Blow of a Smith's Sledge; That two parts of three of the Linnen within this Trunk were pierced or cut thro', the Cut appearing of a Quadrangular Figure, and between two or three Inches over; That the End of the Trunk was likewise forced out, as the Back was drove in; That at about two Foot distance from the End of this Trunk (where the Floor and the Side-Wall of the House joyn'd) there was a small Breach made in the Plaster, where a small Chink or Crevice was

to be seen between the side Board of the Floor and the Wall, so wide as that a Man could thrust his Fingers down ; and that just beneath this again in the Kitchen the Ceiling was forced down, and some of the Lime or Plaister of the Wall broke off ; That exactly under this again stood a large Tub or Vessel of Wood inclosed with a Crib made of Brick and Lime, which was broke and splinter'd all to pieces, and most of the Brick and Lime-Work about it forced and scattered about the Kitchen.

As the Gentlewoman gave me this Account, I went from place to place viewing each particular ; and as I found all was done on or near the Gabel end of the House, I have endeavoured to explain this Description by a Draught thereof, wherein the several Breaches are distinguished : And as I conceived all to be effected by some Irresistible Body, I have also by two Parallel Lines traced out its Irregular Motion. [*See the Figure.*]

The further Circumstances judged material to be offered, which cannot be represented in the Draught, are these : That the Looking glass was broke with that Violence, that there was not a Piece of it to be found of the largeness of Half a Crown ; That several Peices of it were sticking like Hail-shot in the Chamber Door (being of Oak) and on the other side of the Room ; That several of the Edges and Corners of some of the Pieces of the broken Glass were tinged of a Light Flame Colour, as if heated in the Fire ; that the Curtains of the Bed were cut in several Pieces, thought to be done by the Pieces of the Glass ; That several Pieces of Muslin and Wearing Linnen, left (on going to Bed) by this Gentlewoman and Daughter on the great hair Trunk, were thrown and scatter'd about the Room, no way singed or scorched ; and yet the Hair on the Back of the Trunk, where the Breach was made, was singed ; That the uppermost part of the Linnen within the Trunk was safe and well, and the

the lowermost Parcel, consisting of 350 odd Ply of Linnen, pierced thro', of which none was any way smutted, but the uppermost Ply of a Tablecloth that lay above all the rest. The Gentlewoman told me, there was a yellow Singe or Stain perceivable on some part of the other Linnen so damaged the next day; and that the whole Linnen smelt strong of Sulphur; but neither this yellow Stain or Smell was perceivable when I was there. That the Glafs of two Windows in the Bed-Chamber above, and two Windows in the Kitchen beneath, was so shattered, that there was scarce one whole Pane left in any of them; That the Pewter, Brass, and Iron Furniture in the Kitchen were thrown down, and scatter'd about the Kitchen, particularly a large Girdle about 20 Pounds weight, that hung upon an Iron Hook near the Ceiling, was found lying on the Floor; That a Cat was found Dead the next Morning in the Kitchen, with its Legs extended as in a going posture, in the middle of the Floor, with no other Sign of being hurt, than that the Furr was singed a little about the setting on of the Tail.

The Gentlewoman told me too, That about some few Days before this Accident happened to her, she removed a Table Press-Bed from the Place where the Hair Trunk stood, wherein two little Girls (her Daughters) used to lie; which she looked upon as a particular Piece of Providence.

I must further remark, That the Wall both above and below a little Window in the same Gable-end was so shatter'd at the same time, that the Light could be seen thro' the Crevices in the Wall; and that upon a large Stone on the outside of the Wall beneath this Window, was to be seen a mark, as if made by the stroke of a Smith's Sledge or large Iron Crow, with which a Splinter or piece of the Stone was broken off of some Pounds weight.

I was further informed, That from the time of that great Thunder-clap both the Thunder and Lightning diminish'd gradually, so that in an Hours time all was calm and quiet again.

III. *Part of a Letter from Dr. Archibald Adams to Dr. Hans Sloane, R. S. Secr. concerning an Apoplectick Person, in whom, from an Obstruction in the Left Ventricle of the Brain, the Nerves on the Opposite side were affected.*

Norwich, February 18. 1707.

SOME time ago I opened the Head of a Woman who dy'd of an Apoplexy, and in the left Ventricle of the Brain I found betwixt four and five Ounces of clotted Blood, in the right Ventricle no Blood at all, but every thing as usual; and all the Nerves which commanded the right side of the Body were as strong as any I ever observ'd in a sound Animal, especially in their Origin, and as far as I could trace them in their course. It was my Opinion, that which ever Ventricle the Obstruction was in, the Nerves and Muscles corresponding to that side were affected, but here the contrary appear'd plainly, for altho' the Obstruction was in the left Ventricle, yet the sense and motion of the right side were intirely lost, and the small remains of either were observable in the left side.

IV. *A Letter from Mr. Ra. Calep, to Mr. William Cowper, F. R. S. concerning a Woman 62 Years of Age (who is still Living) that lost her Leg and greatest part of her Thigh by a Gangrene.*

THE Wife of Tho. Stever of Maidenhead in the County of Berks, (aged about 62 Years) was seized with a Fever about the latter end of November 1697. Her Physician used various Remedies to remove her Fever, which in about 14 days terminated in a Tumor and Numbness in her left Foot, both which did by degrees creep up her Leg, and half way up her Thigh. A Fomentation was order'd by her Physician made of *Centaur. Alfab. Hyssop.* &c. I oyl'd in a strong *Lixivium*; and after some time order'd them to Anoint her Foot and Leg with *Ol. Turbinib.* wherein *Galbanus* was dissolved. This Method they had used daily for a Month before I saw her. Coming Jan. 3. 1678. from Henly upon Thames (where I then lived) to see some Friends and Relations I had at Maidenhead, they desired me to go and see this Poor Woman; which I did, and found her in the following Condition, (*viz.*) Her Foot and Leg cold, insensible, wither'd, hard as if dry'd in a Churn, and of a dark Fawney Colour. Her Knee was swell'd, and had several large black Spots upon it, which pitted when prest with my Finger. There was several Discolourations in the Skin, half way up her Thigh. She complained of great Pains, especially at Nights, in her Knee and Thigh, yet could not feel me when I touch'd those Parts. Her Fever was now increased again, and she was delirious sometimes. She begg'd heartily of me for help; but alas! what could I propose

to relieve her ? Nothing but the taking off her Thigh, which she wou'd not consent to. I was not sorry for her not admitting of that Operation, because I could not expect any Success in the performing it, by reason of her Age, Weakness, &c. So I took leave of her, supposing I shou'd never see her more. I advised her Friends to continue the use of the Fomentation, which they did almost Night and Day. About a Month after, I coming to *Maidenhead*, was surprized to find this poor Woman alive. There was now a discharge of a Black Fætid Matter, at a small Orifice about the middle of the Inside of her Thigh, which Orifice I enlarged to make a better discharge for the Matter. I likewise cut into a Tumour that appeared upon her Knee, but found nothing in it but Wind. I then took my leave of her, (as before) advising to continue fomenting daily. About a Month or 5 Weeks afterwards, I came to *Maidenhead* again, and found her alive, and to my admiration saw that, which thro' the whole course of my Life I may never see again, (*viz.*) how Nature had made a perfect Separation of the mortify'd Flesh from the sound, quite round the Thigh, the Bone of the Thigh lying wholly bare above the breadth of 4 Fingers, and deprived of its *Periosteum*. The Flesh above was fresh and florid, and had good white Matter upon it. I now perswaded her to let me take off her Thigh, which I did about 2 Fingers breadth in the sound Flesh, (because the Flesh run tapering down to the Bone,) by which I made the Stump pretty even. The Bleeding was little, by reason that the Veins and Arteries (which were eaten asunder by the mortifying Matter) Nature had closed again. I Dress'd the Stump with *Pul. Restring.* mixt with *Album. Ovor.* spread upon Pledgets, and dipt in *Ol. Terebinth.* hot. The next Dressings I used Digestives, and performed the rest of the Cure according to the Rules of our Art. The Woman is alive to this Day, and now liveth in *Maidenhead* over against the *Bear Inn.*

I would have preserved this Leg to have dissected it, but the Friends of the Woman deceived me. They promised me to keep it for me till the next day, which I relying upon, left it with them. So they took that opportunity to Bury it, where I never could find it. I shall forbear sending you my poor Reflection on this case, for fear I should not judge aright. But shall leave it to you, and others, who are more Competent Judges than

August 23.
1707.

Yours, &c.

Ra. Calep.

“ About the beginning of *October* last I happened to
 “ be at *Maydenhead*, where I saw the Woman whose
 “ Case is here related; she appeared to be very decrepid,
 “ and would have shewn me the Stump of her Thigh
 “ bare, but the coldness of the Weather, she said, would
 “ make it uneasy to her. I felt it through her Cloaths,
 “ and the end of the Stump seem’d to be not above four
 “ or five Inches below the Trunk of her Body.

“ Since I have so frequently found the large Trunks
 “ of the Arteries of the Thighs and Legs of Aged People petrified, as I have mention’d in the *Transactions*,
 “ Numb. 280. and most commonly in those who have had
 “ Gingreens in the Legs, &c. I am apt to suspect the like
 “ happen’d in the Crural Artery of this Woman; which,
 “ like a Legature, did at length put a total stop to the
 “ Influent Blood below that Stricture.

Novemb. 27.
1707.

William Comper.

V. *The Manner of making Styrax liquida, alias Rosa Mallas. Communicated by Mr. James Periver, F. R. S.*

Rosa Mallas grows upon the Island Cebros, at the upper end of the Red Sea near Cadess, which is 3 days Journey from Suez : It is the Bark off a Tree (taken off every Year, and grows again) boiled in Salt Water till it comes to a Consistence like Bird lime, then separated and put into a Cask and brought to Judda, and so to Mocba in June and July, where it sells from 60 to 120 Dollars per Barrel, according to its Goodness : The best is what is freest from Clay and Dirt, which is commonly mixed with it ; and the way to try it is by washing it in Salt Water, which will cleanse it : The Arabs and Turks call it *Cotter Mija*.

N. B. A Barrel is 420 l.

L O N D O N,

Printed for Henry Clements at the Half-Moon in
St. Paul's Church-yard. M DCC VIII.

fig. 1.

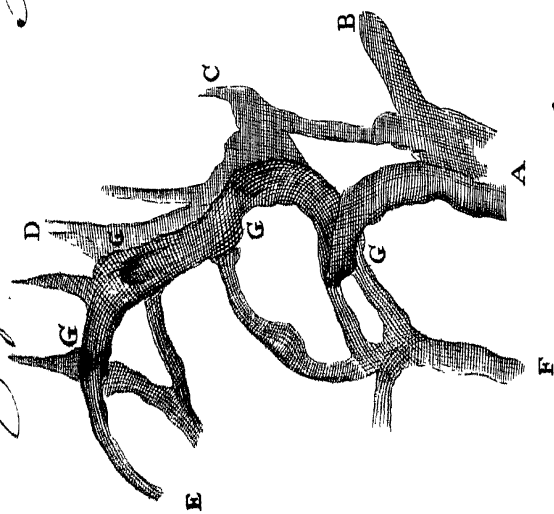


fig. 3.

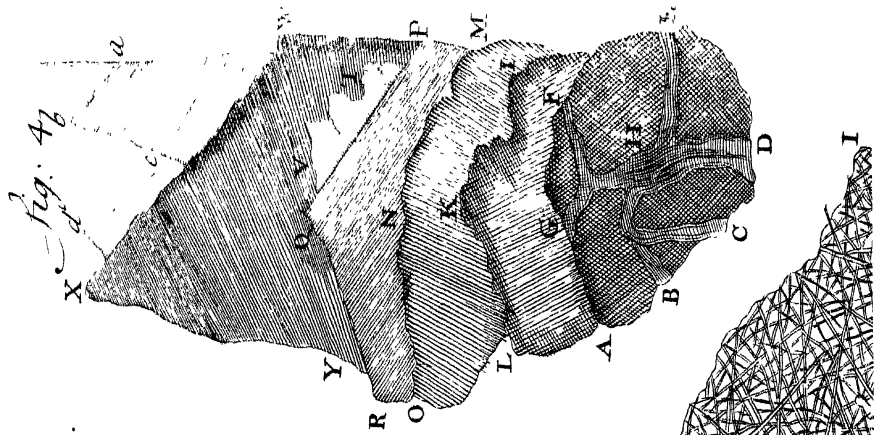
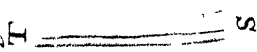
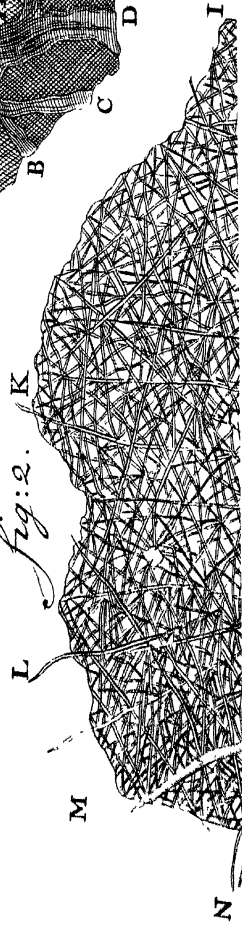


fig. 4.

fig. 2.



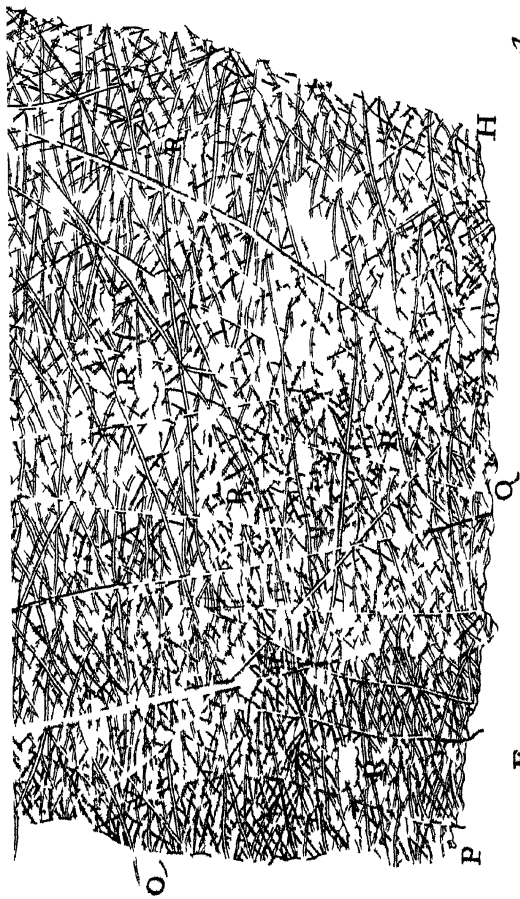


fig 6

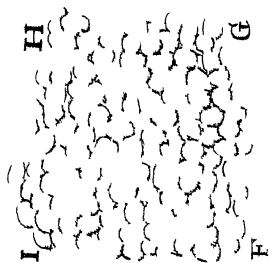


fig 5

PHILOSOPHICAL TRANSACTIONS.

For the Months of March and April, 1708.

The CONTENTS.

- I. *The Practice of Purging and Vomiting Medicines according to Dr. Cockburn's Solution of his Problem ; with Tables shewing their Doses in particular Ages and Constitutions.*
- II. *Microscopical Observations on the Blood Vessels and Membranes of the Intestines. In a Letter to the Royal Society, from Mr. Anthony Van Leeuwenhoek, F.R.S.*
- III. *An Account of the Manner of Manuring Lands by Sea-shells, as practised in the Counties of Londonderry and Donegall in Ireland. By his Grace the Lord Archbishop of Dublin, Communicated by Samuel Molyneux Esq;*
- IV. *De Linearum Curvarum Longitudine : Authore Jo. Craig.*
- V. *An Account of a New Island raised near Sant-Erini in the Archipelago ; being part of a Letter to Mr. James Petiver, F. R. S. from Dr. W. Sherard, Consul at Smirna, &c.*
- VI. *Experiments of the Luminous Qualities of Amber, Diamonds, and Gum Lac, by Dr. Wall, in a Letter to Dr. Sloane, R. S. Secr.*

1. The Practice of Purging and Vomiting Medicines, according to Dr. Cockburn's Solution of his Problem; with Tables shewing their Doses in particular Ages and Constitutions. Inscrib'd to the Learned Dr. Garth, F. R. S. by W. Cockburn, M. D.

*Phil. Transf.
ac. No. 303.*

Postul.

Schol.

Cor. 1.

Prop. 1.

Prop. 2.

Why the Doses of these Medicines so hard to be found.

BY my Solution of the Problem for determining the due Doses of Purging and Vomiting Medicines, in all their Cases, it is manifest in general, that these Medicines operate either upon the account of their being mixed with the Blood, or by their stimulating the Stomach and Guts: 2. That this their Operation is more or less according to the Quantity and Thickness of Blood, *i. e.* a greater Quantity, and the thickest Blood require the greatest Doses: And 3, that when the Quantities of Blood are the same, the Doses of Purging and Vomiting Medicines are in a duplicate proportion of the Bloods thickness. As also, that in every case these Doses must be in a proportion compounded of the Quantity of Blood and those Squares of its thickness.

Now since the Operations of Purgative and Vomitive Medicines depend so much on the Quantity and Viscidity of the Blood, which have not been duly consider'd before; it is no wonder that the Practice of Physick in these Evacuations has been so uncertain, and that the most expert Physicians, from their most accurate Observations, could never determine the true Doses of Medicines, which alter so much according to the various Subjects they work upon; they not being acquainted with the true Method of determining either the quantity of the Blood, or the degrees of its thickness.

Because

Because Experience is equally the Foundation and Touchstone of all reasoning in Physick, we will here submit our Solution to common Observations, and try whether every thing proposed in it, does not exactly answer Matters of Fact, and the visible Operations of Nature.

First then, it plainly follows, that these Medicines al-ways purge best and most constantly in a liquid form; because they are more easily convey'd into the Blood, and can stimulate more parts, and that upon the account of this their Fluidity; whatever may be the way that Purges and Vomits work, or whatsoever their Nature may be. This explains very easily a very common Observation, hitherto very difficult to Physicians, about the different Operation of the same Medicine in different forms: Why, *viz.* the Infusion of a due quantity of a Purging Medicine produces its effects sooner and more constantly than a like quantity of the same Medicine in a Powder, tho' still more constantly in a Powder than a Bolus, tho' still sooner and more constantly in a dry Bolus, than if it be given in Pills made into that form with Gums that do not purge; and this difference in Purging shall even be notable, according to the dissolubility of the Gums.

From whence it follows, that the Evacuation made by such Medicines, is in proportion to the quantity of those Medicines that happens to be dissolv'd, and not to the quantity administer'd.

Secondly, That purging by Draughts is the most excellent form, and will always have the most constant effect.

The next Consideration is, that a certain quantity of any purging Medicine affects us after a different manner, according to the different Quantity and Constitution of the Blood, or its thickness, and it was shewn in the Solution, that if its thickness were the same, the Dose should

should always be as its Quantity, but the Blood differing likewise in thickness, the Doses of Purging and Vomiting Medicines must be augmented on account of its thickness. This is perfectly well confirm'd by daily experience; where we find, that People sick with a manifest thickness of Blood, as in Dropfies, the Jaundice, &c. take far greater Doses than they did at any other time when they were not sick, or in that manner.

By a further Disquisition into this matter, we find that the Doses must not only be greater where the thickness of Blood is greater; but that they must be increas'd in a duplicate proportion of their Viscidity. This is evident by the Tables in *Cassia. viz.* $9 : 83 :: 4 : 33$, 12 , $13 \frac{1}{2}$ gr. and therefore *alternando* $9 : 4 :: 83 : 33$, 12 , $13 \frac{1}{2}$ gr. Therefore the Doses are as the Squares of the Constitutions. So likewise $9 : 83 :: 16 : 143$, $13 \frac{1}{2}$ gr. and *alternando* $9 : 16 :: 83 : 143$, $13 \frac{1}{2}$ gr. *b. c.* the Doses are as the Squares of the Constitutions.

The same is true in any other Constitution besides the mean: For Example, in the lowest and highest $4 : 16 :: 213 \frac{1}{2}$ gr : $853 \frac{1}{2}$. So that by this means we are not only led directly to a right use of these Medicines, and are able to find the true cause why the ordinary Doses produce so very different effects in different Constitutions; but likewise, *The Quantity of Blood in any Person being given together with the ordinary and extraordinary effect of a Dose of a Purging Medicine, the Change of that Persons Constitution, and the Nature of that Change may be determin'd.*

This Doctrine is true because it conforms to Nature. It cannot but be a great satisfaction to the mind to find a Doctrine founded on a few simple Experiences leading us into the cause of many more that are very complex, difficult, and obscure; which is sufficient to prove its conformity to Nature. But my present endeavour being to rectify the common Practice of these Medicines by this Doctrine, I shall frame, by this Method, Tables of the
Purging

Purging and Vomiting Medicines in present use a better adapted to Experience than are hitherto to be found

The Method of framing such Tables, is by setting out the practicable Constitutions in the different Ages that have observ'd to take notable Quantities of Purging and Vomiting Medicines ; so that by comparing these Constitutions with the Ages, we have the different Doses in all those cases, which is all that is requir'd for a better practice ; tho' a more proper occasion may produce a more nice and exact division of Constitutions, very much to the advantage of the Practice of Physick in all Diseases.

The Ages wherein these different Doses are taken, I find to be four ; when a Man is about 16 or 20 Years of Age, and weighs about 12 Stone, he then takes the common Dose : One of nine Years takes three quarters of that ; one of six the half, and one of three Years a quarter. Moreover, it having already been shewn, that the notable healthy Constitutions are but three, as also the notable Pulses of each of these : Let then these Constitutions be as 2, 3, 4. That of the most fluid Blood as the first number, and so on ; in that case, the Dose of any Person will be found by multiplying the common Dose for his Age into the Square of his Constitution and dividing by the Square of the middle Constitution. For instance, If $\mathfrak{z}\mathfrak{j}$. *Cassia* is the common Dose, or the Dose of the middle Constitution, $\mathfrak{z}\mathfrak{i}\mathfrak{j}$. $\mathfrak{z}\mathfrak{j}$. and *gr.* 12 $\frac{1}{2}$ is the Dose of the first Constitution, and $\mathfrak{z}\mathfrak{x}\mathfrak{i}\mathfrak{v}$. *gr.* 12 $\frac{1}{2}$ that of the grossest or last Constitution ; and so proportionably for every Medicine in all the Ages, as appears by the Tables.

This Method seems to answer so exactly, that there is not any thing necessary besides, except a Person is more Loose or Costive than ordinary (which may be known from the Patient or otherways) it is to be reputed the same, as if he had taken an equivalent quantity of a Medicine proper to produce these effects. Any Physician,

who has consider'd this case in some People after Fluxing, will allow the justness of this Exception.

The Doses of Vomiting Medicines

As Vomiting Medicines have the same common Dose: with those that Purge, they admit also of the like divided Doses; which, therefore may be found by the same Tables. Only, as People that are more Costive than ordinary require a proportionable greater Dose of a Purging Medicine: So they require their Dose of a Vomiting Medicine to be considerably less, as is very very well known in hot Countries.

But it must be observed, that in the Tables, *Age* stands instead of *Quantity of Blood*; because they encrease pretty equally, and it makes the practice more easie to such as are not accusom'd to Weights and Numbers.

The more Skillful are desir'd to observe, that the mean Ages, multiply'd into the mean Constitutions, give Doses more nicely.

THE TABLES.

Some Instances shewing the Defects of the present Practice, and how mended by the foregoing Tables.

The Doses of the foregoing Tables, arising from Calculation, agree perfectly well with the common Observation of the best Authors; tho' their Observation is very general and ill made, if we except the very first Steps.

*Authors Con-
trary, but do
not Observe.*

For instance, Authors of all Countries, *English, Dutch, German, Italian and French*, reckon the Doses after the same manner; whereas, if they had been observ'd, they must have been different as are the Constitutions of Men in the different Countries.

II. The defect of their Observation is manifest by the disproportion'd Doses of some Medicines, their high Do-

TABLES,

Showing the ⁽¹⁾ Effects of purging and vomiting Medicines
according to the Solution of Dr. Keil's Problem.

more of their low Doses, which is not conform to Nature; for, let the low Dose be what it will, the high Dose of one Medicine must always bear the same proportion to the high Dose of another, as did their low Doses, *viz.* even. in Manna, they reckon it from $\frac{3}{4}$ commonly to $\frac{3}{2}$ and $\frac{3}{4}$. If it is said that the first Dose is the lowest Dose that is taken by a Man of a due Age, it is neither true in fact nor conform to their own way of reckoning: For instance, Rhubarb is said to be taken from $\frac{3}{4}$ to $\frac{3}{2}$. No body will say that this is the lowest Dose taken by a Man of a due Age as formerly; because it is not in fact true, nor that the high natural Dose is $\frac{3}{4}$; for, as I said before, if $\frac{3}{4}$ of Manna and $\frac{3}{4}$ of Rhubarb are the respective low Doses, then $\frac{3}{4}$ and $\frac{3}{2}$ cannot be the respective high Doses. As to what concerns some extraordinary Doses given by themselves, and far exceeding the ordinary Dose, is easily accounted for by the Solution. There are many Examples of this Nature: Turbith, *viz.* is commonly reckon'd among them from $\frac{3}{4}$ to $\frac{3}{2}$; yet *Marg. gravins*, and good Authors, have given it to $\frac{3}{4}$. So *Colocynthis* from *gr. vi.* to *gr. xij.* and *Fulgin. Fernel. Duncan.* say they have given it to $\frac{5}{8}$.

III. Authors have been far from being exact; for they have only dos'd these Medicines for People of full Age; but have left the Doses of the different Ages in silence; nor have they told us at what time a Man takes his highest Dose, or how that alters in the Growth and Decline of Age, which is still a very great difficulty for the most experienc'd Physicians to manage.

IV. Their general Method is founded in a Mistake; their lowest Dose being really the common Dose taken by the generality of Men, which produces a multitude of Errours in the Practice. This is manifest in their dosing every Medicine.

This shews particularly.

V. The mentioned Case is more manifest by these Tables, and it is two to one but that a Physician over Purges or under Purges any Person in Health ; and if more Cases in Sickness are suppos'd, the odds will encrease proportionably. Experience confirms this exactly : For if the middle Dose is given to one of the lowest Constitution, and the middle Dose is to purge 7 or 8 times ; in that case, the Person of the lowest Constitution is purg'd near twice as much as he ought to be ; and if given to one of the highest Constitution, he is purg'd but half of what he should be. But if the Dose of the highest Constitution is given to one of the middle Constitution, he is purg'd twice as much as he ought to be ; and if given to one of the lowest, he is purg'd four times as much, or about thirty times, as we find true by daily Experience. But if the Quantity of Blood, the Age, or Sickness contribute to the Errour, it may prove fatal. If this Consideration were illustrated by a proper number of Examples, we should find some hundreds of, otherways unavoidable, Mistakes now prevented by the Practice of these Tables.

These Tables shew how the Doses of Children may over purge People of full Age.

Lastly, We may easily account, by these Tables, for the Doses of Children over purging some People of good Health, and of due Age ; a *Phænomenon* so surprizing, that the smallness of the Dose is commonly thought a good Excuse for the Mistake.

II. *Microscopical Observations on the Blood Vessels and Membranes of the Intestines. In a Letter to the Royal Society from Mr. Anthony Van Leeuwenhoek, F. R. S.*

Delft in Holland, April 20. 1706.

I Take the Liberty to acquaint your Honours, that Professor *Bidloo* came to my House *March 7.* desiring me that he might view thro' a Microscope a little piece of Gut, which, he said, was part of the Bowels of a Woman; whereupon I having separated a small Particle thereof from the rest, we discovered in one of the thin Membranes, of which, for the most part, the Gut is composed, a great number of little Fibres and Vessels, which lay in great Multitudes over and across each other, as also some Particles of Fat, which lay like Bunches of Grapes upon the said F-bres.

After that the said Professor *Bidloo* was gone, I was desired, that in case I had discovered any thing remarkable in that little piece of Gut, I would give a brief Account of it.

Whereupon the same Evening I writ to the Persons who desired that of me, that I was considering whether or no those Particles of Fat, which we had discovered, might not be supposed by many People to be Glands or Kernels, and that the same were to be found likewise in the Skin; and the rather, because that I have discovered in the Skin and Guts of Animals none of those Glands, of which People talk so much, but Particles of Fat in great number.

Mr. *Bidloo* having acquainted me how this Woman died, I writ to him thereupon, as follows.

When I observed that little piece of Gut, that was unprepared, nicely thro' my Microscope, I could perceive a great Quantity of Blood lying without the Vessels, which I never did discover in the Guts of other Animals before: from whence I concluded, that as a great many Animals lose their Lives by the spilling of their Blood, that same Blood, notwithstanding the quicker Motion of the Heart in the Pangs of Death, continues its Circulation: Whereas in those that are Hanged or Strangled, as this Woman was, the Circulation of the Blood is in a great measure interrupted by the Rope: To which, if you add the dismal Thoughts of approaching Death, upon Account of the deserved Punishment they undergo, (which Thing does not occur in Beasts) and the great Concern at that time, there will be a much greater protrusion of the Blood of a Rational Creature, than that of a Beast.

Now the Blood being protruded out of the Heart in great Quantities at once, and not being able to circulate with the same quickness thro' the small Vessels, I suppose that the Tunica's or Coats of the exceeding small Vessels are so extended, that the Blood filtrating thro' them, is found in great Quantities without the Guts, where it is dried upon the extream Membrane or Skin, and is found in little Lumps here and there without any Order.

Soon after this, having acquainted Professor *Bidloo* with these my Thoughts, he had the Goodness to send me, on the 12th of *March*, two Dissertations subscribed with the Name of *Peter Evertse*, in *Latin*; from whence a day or two after it was explained to me, that the Woman to whom that Gut belonged had been Hanged, and that in her Life-time she was troubled with a Falling-Sickness.

In the said Dissertations I observed three distinct Draughts of the Figure and Form of the said Gut, and taken by the help of a Microscope; and forasmuch as these Figures did not agree with my Observations, I have taken the Liberty to delineate some small Particles of the said Gut, just as they appeared to me thro' several Microscopes, hoping that it will not be taken ill of me.

I then placed a small Particle of the said Gut with the Outside thereof before a Microscope, to shew how the Blood lay coagulated upon the extream Membrane of the said Gut which was unspeakably thin.

* *Fig. 1.* A, B, C, D, E, F, shews the Blood as it lay spread within a small Compass upon the outmost Membrane of the Gut.

By G, G, G, G, we represented the Oblong sort of Drops, where the Blood had been protruded in an extraordinary thickness, and was coagulated like that Blood that lay upon those Parts which are described by B, C, D, E, and F.

Now as we see how this Blood was protruded thro' the Vessels of the Gut, we may very well suppose that the same happens in other Parts of the Body.

After this I separated the Membranes of the Gut, so carefully from one another, that I imagined I was come to the innermost Membrane; but after that I had observed it with greater Curiosity, I discovered that that Membrane which is here described by *Fig. 2.* H, I, K, L, M, N, O, P, Q, which is the Circumference of it as it appeared to the Painter, was a double Membrane.

In this small Particle, which was drawn thro' a larger Microscope than that of *Fig. 1.* there were such a vast number of small Vessels and Fibres, that it is almost inconceivable, as it was impossible for the Painter to describe all those that he saw of them, especially by reason of those two thin Membranes lying one upon the other; for how thin a Membrane soever one places be-

fore the Microscope, if it be not broken, one can discover not the least Hole or Passage in it ; and when one of these small Fibres or Vessels appear to the Eye, they disappear as soon and escape the Sight ; partly because they are cover'd by other Particles that lie by or near them. and partly because they are torn from the Membrane that lies upon them, to which they had been before united.

By L, M, N, O, are represented the little Vessels or Fibres, which by being separated are standing out of the Membrane.

Now as for those Vessels which are discovered in the aforesaid Membranes, it is impossible for me to judge whether they are Arteries, Veins, Lacteal, or Lymphatick Vessels ; for altho' there are divers Arteries and Veins in such a thin Membrane as is here represented, and tho' there were Blood in them, yet cannot that Blood be discovered, because in such fine Vessels it loses its Colour ; besides the Globules of Blood in such exceeding small Veins and Arteries, if they are not dissolved of themselves, yet by the Expansion of the Gut to bring it into a flat posture, they must necessarily be dispersed and dissolved.

In the said Figure by R, R, R, R, and upon more other Places are represented the little Globules of Fat.

I placed before another Microscope a little Particle of the said Gut, in which, to the best of my Power, I had separated the Membranes that lay upon one another, and that compose the thickness of the Gut, in order to see them the better.

In Fig. 4. By A, B, C, D, E, M, P, W, a, b, c, d, X, Y, R, O, L, is represented a small Particle of the Gut (because it should not take up too much Paper) wherein none of the Parts are described, because it is only to shew how the Membranes are separated from each other ; the Circumference of the extreamest Membrane, of which, together with the Coagulation of the Blood upon

upon it after it had been protruded thro' the small Vessels, is represented by A, B, C, D, E, F, G, H.

The uppermost Membrane is of an exceeding thinness, and very near of such a Form, as in *Fig. 2.*

In the abovementioned *Fig. 4.* A, G, F, I, K, L, is represented the third Membrane; L, K, I, M, N, O, the fourth; O, N, P, Q, R, the fifth; P, T, V, the sixth; P, W, X, Y, the seventh; and by W, *a, b, c, d,* the eighth Membrane.

So that the abovementioned Gut, as far as we have been able to represent it here, consists in Substance or Thickness of eight Skins or Membranes lying upon one another.

Between two of the said Membranes I observed, that there lay some Fibres without any Branches or Sprigs proceeding from them; and pursuing my Observations, there occur'd to my sight some other small Fibres lying close to the rest, which seem'd to me to be torn from other Parts; and a little on one side there lay one of those Particles, which I caused the Painter to view thro' the Microscope, and to draw it as it appears here in *Fig. 5.* A, B, C, D, E.

But pushing on the said Observations farther, and meeting with very few of the same Appearances, I considered whether this Figure might not be purely accidental by its shrinking:

I did also observe, that about the Blood-Vessels which I have already told you, I discovered, as it were shut up under the outmost Membrane, a great many Fat Particles lying; from whence I concluded, that the Woman, who was the Owner thereof, had been very Fat.

I caused some few of those Particles of Fat to be drawn by my Painter, only to show you how those said Particles lie near a Blood-Vessel; they are described by *Fig. 6.* F, G, H, I.

When we consider the great Protrusion of Blood without the Vessels, as it appeared to our Eyes by the help of a Microscope, we may suppose that such Protrusion or Expulsion of the Blood was occasion'd by a great and sudden Fright or Sorrow, or any other Passion ; from whence we may conclude, that in any such Accidents Bleeding is highly necessary, in order to give the Blood room enough in the Vessels for a free Circulation.

Now if the All-Wise Creator had not covered those Blood-Vessels that lie upon our Bowels, which to our Natural Sight seem, as it were, to lie naked, with a very thin, but a very strong Membrane ; that Blood, which, as is said before, is forced thro' the Veins, would run into the Cavity of the Belly, and there stagnating in great Quantities would rot and putrify, and consequently Death must follow : Whereas now, as it is found to lie in small Parcels on the Bowels and other Places, it may be easily dissolved again ; which, if it were not, it would be the Cause of one's Death, or at least of Sickness : But pardon me, that I have gone thus far beyond my Last.

III. *An Account of the Manner of Manuring Lands by Sea-shells, as practised in the Counties of Londonderry and Donegall in Ireland. By his Grace the Lord Archbishop of Dublin. Communicated by Samuel Molyneux Esq;*

BOTH these Counties are very mountainous, and those Mountains covered with Bogs and Heath, in so much that there is little Arable Ground in them, except what has lately been made so. There are three ways practis'd to reduce Heath and Bog to Arable Land: The first is by cutting of the Scurf of the Ground, making up the Turf so cut in heaps, and when the Sun has dried these Heaps, they are then set on Fire; when burnt as much as they can be, then those heaps are scattered on the Ground, and it being Plowed, it beareth Barley, Rye, or Oats, for about three Years.

The Inconveniences are first, that such Burning defiles the Air, causeth Rain and Wind, is not practical in a wet Summer; and by destroying the Sap of the Earth and Roots of the Grass, and all other Vegetables, renders it useless for several Years after the third, in which it is Plowed.

The second way is by Liming; this is much better than the former, because it doth not so much Depauperate the Ground, will last long, and beareth better Grain, and whatever is pretended, doth not destroy the Grass, if due care be taken not to over Plow it; but then this is very dear, and Lime-stone is not every where to be had, and in many Places Fire is wanting.

Dung is the Common Manure in all places, and therefore I shall say nothing of it.

Marl is not used, that I have observed, in the North, but about the Sea side the great Manure is Shells: Any one that will look into the Map, will see how the Bay of *London*, commonly call'd *Loughfoyle*, lies; towards the Eastern part of it there lies several Eminencies that hardly appear at Low Water; these are made of Shells of Sea-fish of all sorts, more particularly of Periwinkle, Cockles, Limpet, &c. The Country Men come with Boats at Low Water, and carry Loads of these Shells away; they leave them in heaps on the Shoar, and there let them lie till they drain and dry, and by that means become much lighter for Carriage; they carry them by Boats as far as the Rivers will allow them, and then in Sacks on Horses perhaps six or seven Miles into the Country; they allow sometimes 40, but mostly 80 Barrels to an Acre; they agree with Boggy, Heathy, Clay, Wet, or Stiff Land, but not with Sandy. They seem to give the Land a sort of ferment, as Barm doth to Bread, opening and loosening the Clods, and by that means making way for the Roots to penetrate, and the Moisture to enter into the Fibers of the Roots: The Manure continues so long, that I could find none that could determine the time of its enduring.

The Reason of its long continuance seems to be this, that the Shells melt every Year a little till they be all spent, which requires a considerable time, whereas Lime, &c. operates all in a Manure at once; but it's to be observed, that in six or seven Years the Ground grows so mellow, that Corn that grows on it becomes rank and runs out in Straw to such a length, that it can't support it self, and then the Land must be suffered to lie a Year or two, that the ferment may be a little quieted and the Clods harden, and then it will bear as long again, and,
for

for ought I know and could find it, continues to do so with the like intermissions for 20 or 30 Years.

In the Years in which the Land is not Plowed, it bears a fine Grass mixed with Daisies in abundance ; and it is pleasant to see a steep high Mountain, that a few Years before was all Black with Heath, on a sudden look white with Daisies and Flowers.

It smother the Grass, but makes it short tho thick : Observing that this Manure produced Flowers in the Field, I made my Gardener use these Shells in my Flower Garden, and never saw better Carnations, or Flowers fairer or larger than in that Cold Climate ; and it contributes to destroy Weeds, at least doth not produce them so much as Dung ; it likewise produces very good Potatoes at about a Foot distance from one another ; and this is one Method of reducing *Fertile* Barren Land. They lay a little Dung or Straw on the Land and sprinkle it with Shells ; sometimes they cut the Potatoes if large, that they may go the farther, and then dig Trenches about six or seven Foot distance, and throw the Earth or Soil they take out of them on the Potatoes, so as to cover them, and then fencing the Plot of Ground so planted, let them grow. Plant them in *April* or *May*, and they are ripe in *August* ; they dig them as they have occasion, and let them lie till next Year, then dig them again, and so the third Year, every Year they by this means go deeper in the Earth, and the last they dig them, then pick them out as carefully as they can, that little Seed may remain ; and the fourth Year they Plow the Ground and Sow Barley, and the Produce is very good for some Years ; some Potatoes will remain and grow up without any hurt to the Barley or Oats, and those they dig and pick out, and the Ground remains good and Arable ever after.

'Tis observable, that Shells do best in Boggy Ground, where the Surface is Turf ; Turf generally is nothing but the Product of Vegetables, such as Grass, Heath, &c.
shac

that being rotten the Salt is washed away by the Water, and there remains only the Earthy, and especially the Sulphureous parts of them, as appears from the Inflammability of Turf; now Shells being chiefly a Salt, it incorporates with the Sulphur of the Plants, and renders them fit for the Vegetation of New Plants.

And this appears further from this, that Shells, that have been under the Salt Water, are much better then such as have been in the Earth, or dry at the Strands: Almost about the Bay of *Londonderry* if you dig a Foot or two it yields Shells, and whole Banks are made up of them; but these, tho' more rare then such as are brought out of the Shell Island, are not so profitable for Manure.

I observed in a place near *Newtown Lamavady*, about two Miles from the Sea, a Bed of Shells, such as lie on the Strand; the place was cover'd with a Scurf of wet spouty Earth about a Foot thick; the Country People used the Shells, but they were not reckon'd so good as those that are found in the Sea or near it.

The Land about the Sea-side bears very indifferent Wheat, nor will the Shells, in that particular, without some Dung; but I very much doubt whether that be not due to the ignorance of the Farmers that generally understand nothing of Wheat.

Some thousands of Acres have been improved by the Shells, and that which formerly was not worth a Groat per Acre, is now worth four Shillings: They have in many Places thus improved the very Mountains that before were very Turf Bogs. In these they meet with this inconveniency, that if the Season for Plowing proves wet, their Horses sink so deep in the Soil, that they can't Plow it, especially after two or three Years.

They commonly made Lime of the Shells formerly, and some do so still. I have not, that I remember, seen any such Lime, but I understood that it bound very well,
and

and I believe it is not so corrosive as Lime made of Stones; for I find in the History of *Ceylon*, that they make up their Land with Lime of Oyster-Shells, and which, I believe, would be impracticable with common Lime.

About thirty Years ago they made Lime of the Shells, and Manured their Lands with it; but a poor Countryman, that out of Laziness or Poverty had not provided to make Lime, threw the Shells unburnt on his Land; his Crop proved as good as his Neighbours, and the second and third Crop better, and all took the hint, and have used them so ever since.

Where Shells are not to be procured, Sea Rack or Sand supply the want of them, but are not so good; Sea Rack lasts but three years, and Sand little longer.

'Tis certain *Ireland* has been better Inhabited than it is at present: Mountains, that now are covered with Boggs, have formerly been Plowed; for when you dig five or six Foot deep, you discover a proper Soil for Vegetables, and find it Plowed into Ridges and Furrows: This is observable in the Wild Mountains between *Ardmagh* and *Dundalk*, where the Redoubt is Built, and likewise on the Mountains of *Altmore*: The same, as I am informed, has been observed in the County of *Londonderry* and *Donegall*; a Plow was found in a very deep Bogg in the latter, and a Hedge with Wattles standing, under a Bogg that was five or six Foot deep above it. I have seen the Stump of a large Tree in a Bogg ten Foot deep at *Castle-Forbes*; the Trunk had been burnt; and some of the Cinders and Ashes lay still on the Stump. I have seen likewise large Old Oaks grow on Land, that had the Remains of Ridges and Furrows. And I am told, That on the top of an high Mountain in the North, there are yet remaining the Streets and Footsteps of a large Town; and in truth, there are few places, but either visibly, or when the Bogg is removed, there remains marks of the Plow; which sure must prove, that the Country was well Inhabited.

Inhabited. It's likely that the *Danes* first, and then the *English* destroyed the People; and the old Woods seem to those that pretend to judge, to be about three or four hundred years standing, which was near the time that *Courcey* and the *English* subdued the North of *Ireland*, and 'tis likely made havock of the People that remained after the *Danes* were beat out of *Ireland*.

IV. De Linearum Curvarum Longitudine Authore Jo. Craig.

L E M M A.

Duorum Quadratorum summam in alia duo Quadrata dividere.

SINT dz^2 , ds^2 duo Quadrata data, quorum summa $dz^2 + ds^2$ dividenda est in alia duo Quadrata dx^2 , dy^2 ; sintque m , & n duo quilibet numeri ad arbitrium sumendi. Jam ex conditione Problematis est $dx^2 + dy^2 = dz^2 + ds^2$, unde (ut ex Diophanto constat)

$$\text{erit } dx = \frac{mm - nn \times dz + 2mn ds}{mm + nn},$$

$$dy = \frac{nn - mm \times ds + 2mn dz}{mm + nn} \dots \text{Q. E. J.}$$

P R O B L E M A.

Prox. innumeras invenire, quæ sint ejusdem Longitudinis cum Curva quavis data, seu Algebraice sive Transcendente.

Designent. z , & Coordinatas Curvæ propositæ; & x , y Coordinatas Curvæ quævis, quæ ejusdem sit longitudinis cum proposita; Unde ex Curvarum Elementis $dx^2 + dy^2 = dz^2 + ds^2$, Ideoque per Lemma præcedens

$$dx = \frac{m m' - n n' dz + 2 m n' ds}{12 m + n n'}$$

$$dy = \frac{n n' - m m' ds + 2 m n' dz}{12 m + n n'};$$

Quorum integrales sunt

$$x = \frac{m m' - n n' z + 2 m n' s}{12 m + n n'},$$

$$y = \frac{n n' - m m' s + 2 m n' z}{12 m + n n'}.$$

Et sic innolescant Coordinatæ x , y unius ex Curvis quævis; similiter ex hac una invenietur secunda, ex secunda tertia, & sic porro innumerae invenientur . . .
Q. E. J.

Exempla iam non addo, nam postea (Deo volente) opportuni erit dabitur locus, in quo Methodus hæc ad plura hujusmodi Problemata extendetur, & Solutio Problematis

hujus per Exempla illustrabitur. Et quidem hanc Solutionem semel iterumque tam apertè indicavi, ut facillimè à quovis in his versato deduci possit ex iis, quæ subjunguntur Solutioni Casûs specialis hujus Problematis, in quo scil. Curva proposita est Algebraica, quamque exhibui in Actis Phil. R. S. Jan. 1704, ut Clarissimo Problematis propositori D. Jo. Bernoulli constaret illius Solutionem è Methodis Calculi differentialis inversis maximè tritis posse obtineri, utpote qui in privatis suis ad D. Cheynæum Litteris significabat eandem non posse exhiberi per Theoremata nostra in Actis Phil. R. S. Mart. 1703. publicata. Et quoniam ex Actis Erud. Aug. 1705. percipio solutionem illam (quæ scopo prædicto satis superque satisfaciebat) Doctissimo Viro non arridere, ideo modo præmissam Solutionem nulli objectioni obnoxiam publici juris facio. Necessè itaque est ut Clariss. Bernoulli agnoscat vix ullum dari Problema, cujus Solutio ex Calculo Integrali facilius deducitur, quam sui de Transformatione Curvarum.

Quæ verò in ipsius Bernoulli Solutione displicent paucis enarrabo. Et Primo, Quod ad Curvas tantum Algebraicas eandem extenderit. Secundo, Quod Mechanica tantum sit, à Motu (ut vocat) Reptorio tota dependens. Immortali quidem honore dignus est Hugenius ob inventum Evolutionis Motum, quia & ipse & post ipsum alii plurima egregia Theoremata Geometricè exinde deduxerunt. Sed nec Motus Leibnitii Tractionis, nec Bernoulli Motus reptorius cum Hugenii Motu evolutionis comparabuntur, donec cum Hugenio celeberrimi viri Curvas per Motus suos genitas ad leges Geometricas revocaverint quod cum neuter eorum præstiterit, ideo Problematum Solutiones dependentes à Curvis per Motus suos genitis inter Mechanicas solum annumerari possunt.

V. *An Account of a New Island raised near Sant-Erini in the Archipelago ; being part of a Letter to Mr. James Petiver, F. R. S. from Dr. W. Sherard, Consul at Smirna, &c.*

Smirna, July 24. 1707.

I Just now receiv'd a Letter from our Consul at *Milo*, with the following Account of a New Island, &c. Take it in his own Words.

“ There happening in this part of the *Archipelago*, at
 “ the Island of *Sant-Erini*, a great Curiosity, I have
 “ thought it worth your Notice. On the 12th of the
 “ last Month there began to rise up an Island a Musket-
 “ shot distant from the Island of *Sant-Erini*, which con-
 “ tinually increasing from Day to Day in the same man-
 “ ner, and troubling the Sea, there arose up several
 “ Rocks, that fixed themselves to this Island ; so that
 “ at this time it is about half a Mile in Circumfe-
 “ rence.

Milo, June 21. 1707, N. S.

Several others have much the same Account. I have writ to *Sant-Erini* for a piece of the Rock, and a more distinct Relation. which you may expect by my next, if worthy of Communication.

W. S.

From the Paris Gazette, dated April 14, 1708.

Constantinople, Jan. 4. 1708.

They write from the Island of *Sant-Erini* in the *Archipelago*, about 28 Leagues North of the Town of *Candia*, on the first of *December* last, that there was sprung up an Island from the Bottom of the Sea, which at that place is very deep, formed of Stones cast up by a *Volcano* under ground at the Bottom of the Sea, which has often produced the same Effects, and after the same Manner. In the Year 726, in the time of the Emperor *Leo Isaurius*, there was formed an Island on the North side, called the *Burnt Island*, by Matter vomited up and heaped together by this *Volcano*. In the year 1427, in the Month of *December*, this *Burnt Island* was increased by great Rocks cast up by Subterraneous Fires. In the year 1630, in the Month of *September*, the *Volcano* again took Fire, and produced the same Effects, without forming any Island, but only a Shelf or Bank 10 Fathom under Water in the Sea, where it has no Bottom. Lastly, In the Month of *November* last, 1707, the *Volcano* made an Island, which is already two Miles in Circumference, and increases yet (this first of *December*) by Rocks and other new Matter that is thrown up. This Burning was preceded, as at all other times, by violent Shakings of the Earth, followed by a thick Smoak that rose out of the Sea in the day time, and Flames in the Night, and accompanied with a terrible roaring under Ground. There is no Example of the Effects of any *Volcano* at Land like these in the Sea; and yet what renders them the more credible, is, that the Island of *Sant-Erini* itself, is almost all of it composed of Burnt Rocks and Pumice-Stones: It produces some sorts of Grain, but has neither Rivers nor Springs, nor any other Water but what is saved in Cisterns.

VI. *Experiments of the Luminous Qualities of Amber, Diamonds, and Gum Lac, by Dr. Wall, in a Letter to Dr. Sloane, R. S. Secr.*

S I R,

HAVING lately observ'd several natural solid *Noctiluca's*, not hitherto by any, as I know, taken notice of, (I think I may be well assur'd some of the *Phenomena* never were,) at your Request I give you the larger account of 'em: But, before I speak of my own Observations, give me leave to inform you a little concerning the *Artificial Phosphorus*, which, you know, is a Subject I'm pretty well acquainted with, having made a great number of Experiments about it. whereby I was naturally led to the following Remarks.

You may remember my telling you many Years ago of my good Friend Mr. Boyle's communicating to me, about the Year 1680, his way of making the *Phosphorus* with Urine, at the same time desiring me to use all my Endeavours to find out some other Subject, from whence it might be made in greater Quantity, and perhaps he might have made the like Request to many more; for, to use his own Words, he said, he really pity'd his Chymist, who was forc'd to evaporate so prodigious a Quantity of Urine, to get a very little of the *Phosphorus*. Soon after, in order to see some Experiments in Chymistry, I lodg'd for a short time at his Chymist's House, one Mr Bilgar, then living in *Mary-le-Bone Street* near *Pied-dilly*, who indeed was equally, if not more importunate with me than Mr. Boyle, to try if I cou'd find out some other

other Matter, from which more might be made than from Urine, telling me there was so great a demand for it, that it would be of very great advantage to him. It being then a very hot Summer, I caus'd a piece of the dry'd Matter in the Fields, where they empty the Houses of Office, to be digg'd up, in which, when broken in the Dark, a great number of small Particles of *Phosphorus* appear'd: This Matter I carry'd to Mr. Boyle, who view'd it with great Satisfaction, and Mr. Bilgar, by his Direction, fell to Work thereon, but from it cou'd make very little or no *Phosphorus*, till another Matter was added to it in Distillation, and then he cou'd therewith make large Quantities, to his great Profit; for while I was at his House, I often saw him make it, and sell it for six Guineas, and six *Louis d'Ors* an Ounce, whereby he got so much Money, that, I believe, he thought himself above his Business, and quickly left *England*; so that we lost an Honest and Ingenious Chymist, and Mr. Boyle a Faithful and Industrious Servant. I forbear to mention the abovesaid Matter in kindness to Mr. Godfrey, who succeeded Mr. Bilgar as Chymist to Mr. Boyle, and is the only Person, that I know of, who now makes it.

Now, Sir, my being, as you have heard, well acquainted with the Artificial *Phosphorus*, was the occasion of my making many Reflections about it, and caus'd me to consider, whether there might not be *in rerum natura* other natural ones, besides those that Mr. Boyle and some others have given an account of.

You well know, Sir, that Humane Urine and Dung do plentifully abound with an *Oleum* and Common Salt, so that I take the Artificial *Phosphorus* to be nothing else but that Animal *Oleum*, coagulated with the Mineral Acid of Spirit of Salt, which *Coagulum* is preserv'd and not dissolv'd in Water, but accended by Air.

These

These Considerations made me conjecture that *Amber*, which I take to be a Mineral *Oleofum* coagulated with a Mineral Volatile Acid, might be a Natural *Phosphorus*, so I fell to make many Experiments upon it, and at last found, that by gently rubbing a well polish'd Piece of Amber with my Hand in the dark, which was the Head of my Cane, it produc'd a Light; whereupon I got a pretty large piece of Amber, which I caus'd to be made long and taper, and drawing it gently thro' my Hand, being very dry, it afforded a considerable Light. I then us'd many Kinds of soft Animal Substances, and found none did so well as that of Wool. And now new *Phenomena* offer'd themselves; for upon drawing the piece of Amber swiftly thro' the Woollen Cloath, and squeezing it pretty hard with my Hand, a prodigious number of little Cracklings were heard, and every one of those produc'd a little flash of Light; but when the Amber was drawn gently and slightly thro' the Cloath, it produc'd a Light but no Crackling; but by holding one's Finger at a little distance from the Amber, a large Crackling is produc'd, with a great flash of Light succeeding it; and, what to me is very surprizing, upon its eruption it strikes the Finger very sensibly, where so ever apply'd, with a push or puff like Wind. The Crackling is full as loud as that of Charcoal on Fire; nay, five or six Cracklings, or more, according to the quickness of placing the Finger, have been produced from one single Friction, Light always succeeding each of 'em. Now I make no question, but upon using a longer and larger piece of Amber, both the Cracklings and Light would be much greater, because I never yet found any Crackling from the Head of my Cane, altho' 'tis a pretty large one; and it seems, in some degree, to represent Thunder and Lightning; but what to me is more strange than all I have been telling you is, that tho' upon friction with Wool in the day time, the Cracklings seem to be full as many and

as large, yet by all the Lights made, very little Light appears 'till it is in the darkest Room; and the best time of making use of 'em is, when the Sun is setting, or about the Morning; and when the Sun is up, tho' the Moon shines up to Light, the Light is the same as in the darkest Room, which makes me chuse to call it a *Noctiluca*.

I will not presume to give you my Thoughts concerning Amber, (which seems to be a Secret store, and an inexhaustible Treasure of Light: way up to a farthation the Light doth, as it were, bestrid all our eyes, a number of places: Nor why upon an empty stick, or a stick not give these Cracklings and Light, unless the Light, or some other Body, be held at a little distance from it? Nor why in a crackling, or a Crackles, should give it more or no Light till the Sun is set down? but I have more to tell of these few things, amongst many others, so that if I could provoke you, Sir, to give me your Thoughts about them, not knowing any one so capable of doing it as your self: And the Friendship you have always profess'd to me, makes me hope you'll be pleas'd to excuse this irregular account of my Observations, for you have 'em in the same order just as I made 'em.

As the Artificial *Phosphorus* led me to that of Amber, so Amber directed me to that of a *Diamond*. It is a shining Electrical as well as the other, which is also a Natural *Phosphorus*, or rather a *Noctiluca*, exceeding all others and may, without any Exception, be call'd a Miracul *Phosphorus*, it being, as I think, the most pure of all *Phosphorus*, coagulated with a Miracul *Acidum*; and it in the Discovery of this I have not oblig'd the Learned, but in hopes I shall all those who deal in *Diamonds*; for none of the many I have talk'd withal know any thing of the Matter; tho' Mr. Boyle has given the World an Account, at the latter end of his *Book of Colours*, of Mr. Clayton's *Diamond*,

Diamond, and afterwards says, that some Diamonds wou'd, and some wou'd not shine in the Dark: But if any one else has since then made a Discovery, that all Diamonds wou'd give Light in the Dark. they have been very unkind to the World in not letting them know it, because I'm well assur'd that a great many People have been but too often cheated with 'em, which I hope to prevent for the future; but thus much I must take leave to say, that I never understood any such thing till I discover'd it my self, tho' now I remember, that Mr. *Doyle* several times spoke to me of Mr. *Clayton's* Diamond, lamenting that he cou'd not prevail with the Owner to part with it at any rate. I have now by me a yellow Diamond, which I have shewn to a great many Jewellers and others, and but a very few of 'em will allow it to be a Diamond; but by as many Tryals as I have made, I think my way of distinguishing Diamonds is so certain, that none need fear to affirm 'em to be so, even upon Oath.

A Diamond, by an easie slight friction in the Dark, with any soft Animal Substance, as the Finger, Woollen, Silk, &c. appears in its whole Body to be Luminous; nay, if you keep rubbing for a little while, and then expose it to the Eye, 'twill remain so for some little time: But if the Sun be 18 Degrees below the Horizon, if any one holds up a piece of Bays or Flannel stretch'd tight between both hands, at some distance from the Eye, and another rubs the Bays or Flannel with a Diamond swiftly and pretty hard on the other side of it, the Light to the Eye of him that holds it, seems much more pleasant and perfect than any other way I have yet try'd. But what to me seems more surprizing than all I have mention'd, is, that a Diamond being expos'd to the open Air in view of the Sky, gives almost the same Light of it self without rubbing, as if rubb'd in a dark Room; and if in the

L

open

open Air you put your hand or any thing else a little over it, to hinder its Communication with the Sky, it gives no Light: And I do assure you, I have try'd all or most of the other Precious Stones, but could find no such *Phænomena* in any of them; and I must further add, that all the Experiments here related were made at the latter end of *May* and beginning of *June*, and therefore I can't pretend to account for the *Phænomena* that may attend Experiments made while the Sun is on the other side of the *Equator*.

There are some other Bodies that afford Light, and perhaps many more remain yet undiscover'd, but I'm well assur'd, that all or most of the Bodies which have an Electricity yield Light; for in my Opinion, 'tis the Light that is in 'em, which is the cause of their being Electral, yet this Electricity never shows it self without friction; if you rub any Body that has an Electricity, and apply it near to some light Bodies, as particularly very thin Slices of Cork, 'twill put them into a great Agitation, and make them seem to the Eye as hanging at the Body by a fine Hair.

I forbear speaking of Jet, which seems to me to be a black Amber, having most of the Properties of Amber, but not so perfect and pure.

I must not forget to speak of another Substance so frequently made use of by almost all sorts of People, not hitherto by any, I as know, taken notice of to be endued with a luminous Quality, which is also another Natural *Phosphorus*, or *Noctiluca*, and that is *Gum Lac*, and also Red Sealing-Wax, which is made with *Gum Lac* and *Cinabar*, the *Cinabar*, no way impeding, but rather promoting its Luminous Quality, for I caus'd long taper Rolls to be made up of *Lac* alone, and of pure Red Sealing-Wax, both being well polish'd: The Sealing-Wax upon friction, seems to me to emit its Crackling and Light sooner than the *Lac*,
which

I impute to the *Cinabar's* constringing its parts, tho' I think *Lac per se* has the greatest Electricity, both having all or most of the Properties of Amber; and by all the Tryals I have hitherto made of *Lac* and Sealing-Wax, I find that tho' the Cracklings are as plentiful in the day time, as when the Sun is down, yet in the darkest Places I cou'd discover but a little appearance of Light, so that this deserves the Name of a *Noctiluca* or *Phosphorus*, as well as the others already spoken of, it being no other than a Vegetable *Oleosum* coagulated with an Animal Volatile *Acidum*. I don't know in the Animal Kingdom, any thing but Pismires that affords a Volatile Acid, and in the *East-Indies* there's a large kind of em, that live on the Sap of certain Plants, affording both a Gum and a Colour, which Sap passing thro' the Body of those Insects or Animals, is by their Acid Spirit converted into an Animal Nature; which is the reason that with the Colour extracted from *Gum Lac* (which *Gum Lac* is nothing else but the Excrements of these Insects or Animals) almost as good and full as lasting Colours are made as from *Cochinele*: I'm the more confirmed herein, because I know of an Artificial way of converting Vegetable Colours into an Animal Nature very much like this, by which the Colours are made more pleasant and permanent, the Method whereof I shall forbear mentioning at present, and refer it to what I may hereafter have occasion to write in relation to Colours. After the same manner the remaining Gum, which is an *Oleosum*, being digested and passing thro' the Bodies of those Insects or Animals, is by their Volatile Acid converted into a Vegetable-Animal *Phosphorus*, or *Noctiluca*; the Artificial *Phosphorus* is a Mineral-Animal *Phosphorus*, whereas I take the others to be altogether Mineral.

Perhaps, Sir, this hasty and short Account of my Observations may by some be thought little better than a

Trifle, so might probably be the attraction of Iron by the Leadstone, when that was the first observable *Phænomenon* in it; which tho' small in it self, yet gave to the Curious an occasion of finding out the other Properties of that Mineral, which have been since improv'd to an Universal Benefit in the discovery of new Arts and new Worlds. And I am not without hopes but that some more elevated and happy Genius may arise, under whose Conduct these Hints may be carry'd on to an height not eise to be foreseen by Persons of short Views, whose Conceptions are confin'd within the narrow limits of what's already known, and whose Self-sufficiency sooths 'em with a *Ne plus ultra*.

Thus, Sir, I please my self with the remote prospect of new Scenes in Nature, which, tho' imperfect at present, may in time by some skilful Hand be finish'd and fitted for a nearer view, tho' before that time shall come, nothing may remain of me besides this Testimony of my good Will to Mankind, and particular respect for you.

ADVER:

ADVERTISEMENT.

WHereas in the perusal of the late eminent Mr. Ray's *Physico theological Discourses*, Dr. Lister's *Treatise de Cochlitis Angliæ*, Dr. Robert Plot's *Natural Histories of Oxfordshire and Staffordshire*, Dr. Woodward's *Essay*, some *Papers in the Philosophical Transactions*, and several other Books; the Discourses on *Formed Stones*, and their Origin, are not so clearly understood, for want of a competent knowledge of those Bodies: Notice is hereby given, that the Curious in that part of Natural History, may for one Guinea, be supply'd with Specimens of all the following figur'd Fossils by Alban Thomas, Librarian of the Ashmolean Repository in Oxford.

A.

1. **A**Culeus, *Fairy Pins*, or *Fossil Bristles of the Sea-Urchin* or *Hedge-bag*, call'd otherwise the *Sea Egg*.
2. Alveolus, *The Scale*. *
3. Asteria, *The Star-stone*.
4. Astroides, *The Astroite*. An Irregular *Coralline-stone*, naturally Engrav'n with Asterisks.
5. Auricularia Plotii, *The Lid or Cover of a small Capsular Oyster*.

B.

- 6. Belemnites, *The Thunderbolt.*
- 7. Bidentula, *The Forket.* *
- 8. Branchiale, *The Gill-stone.*
- 9. Baccinites, *The Trumpet-Fish.*
- 10. Bufonites, *The Toad-stone, or Capsular Ichthyodont.*

C.

- 11. Cochlites, *The Cochlite or Snail-stone.*
- 12. Columellus, *The Shaft.* *
- 13. Corallium, *Fossil Coral.*
- 14. Cornu Hammonis five nautilites, *The Sayler (or as 'tis commonly call'd) the Snake-stone.*
- 15. Crystallus, *Crystal.*
- 16. Curvirostra, *The Wry-neb.* *

E.

- 17. Echinites, *The Ecknite, or Fossil Sea Urchin.*
- 18. Echinodos, *The Ekinod or Fossil Tooth of the Sea Urchin.* *
- 19. Entrochus, *The Bead, St. Cuthbert's Bead.*

F.

- 20. Fluor, *Spar.*
- 21. Fungites, *The Champinion or Toad-stool.*

G.

- 22. Glossopetra, *The Lancet, or Mucronated Ichthyodont, some sorts whereof are Fossil Shark's Teeth.*
- 23. Gryphites, *The Hawk's-Bill, or Ague-shell.*

H.

- 24. Hippocephaloides, *The Horse-head. This is only the Kernel or Stone included in the Wry-neb.* *

I.

- 25. Ichthyospondylus, *The Spondyl, or Fairy Salt seller.*

L.

- 26. Lapis Judaicus five Radiolus, *The Ecknite spoke, or Fairy Cucumber.*
- 27. Lithoxylon, *The Pierdebois, or (as commonly supposed) petrify'd Wood.*

M.

28. Musculites, *The River Muscle-stone.*
 29. Mytiloides, *The Mytilod, or Sea Muscle-stone.*

N.

30. Nerites, *The Nerite, or Fossil Sea Snail. **

O.

31. Ostreites, *Fossil Oyster.*

P.

32. Pectinites, *The Escallop.*
 33. Pholas, *The Pholad, or Skronded Shell. **
 34. Pisolithus, *The Pisolite, or Gland.*
 35. Plectronites, *The Argot, or Cock spur Ichthyodont.*
 36. Porpites Plotii, *The Porpite, or Capillary Button-stone.*
 37. Porus, *The Pore Stone, or Pore Coral.*
 38. Punctularia, *The Punctulary, Soap stone, or Porous Marble siliquaftre.*

R.

39. Ricinus, *The Tyke siliquaftre. **

S.

40. Sacculus, *The Satchel.*
 41. Selenites, *Moon stone, or Cat Silver.*
 42. Siliquastrum, *The Shale, or Siliquaftre : An Ichthyodont, resembling leguminous Husks.*
 43. Siphunculus, *The Syringe, or Greater Pipe-stone. **
 44. Stalagmites, *The Drop stone. **
 45. Strigofula, *The Furrow Shell. **

T.

46. Talcum, *Talck.*
 47. Tellinites, *The Tellinet, or Lesser Muscle-shell. **
 48. Terebratula, *The Hole-neb, or Oilet-shell.*
 49. Trichites, *The Bristle stone.*
 50. Trochites, *The Whirle, or Top-shell. **
 51. Tubularia, *The Tubulary, or Lesser Pipe-shell.*
 52. Turbinites, *The Spindle Periwinkle. **

Any Gentlemen desirous of such a Collection, may please to send their Orders either to the above mention'd Alban Thomas, or to any of their correspondents in Oxford. Each Fossil (as also the place where found) will be named according to Mr. Lhuyd's Lithophylacii Britannici Ichnographia ; and they may command, if they please, two or three Samples, or else distinct Species of each kind ; excepting those which are distinguish'd with an Asterisc.

L O N D O N,

Printed for Henry Clements at the Half-Moon in
St. Paul's Church-yard. MDCCLVIII.

Fig. 4.



Fig. 5.



Fig. 6.



Fig. 7.



Fig. 2.

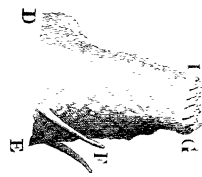


Fig. 3.

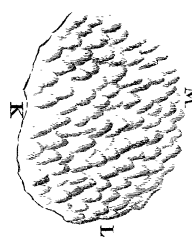


Fig. 1.



Fig. 8.

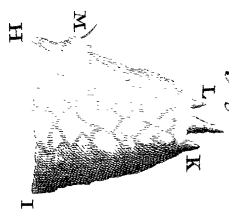


Fig. 9.

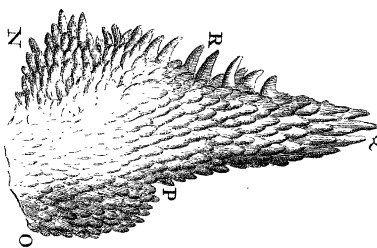


Fig. 10.



Fig. 11.

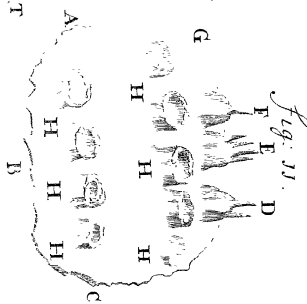


Fig. 12.

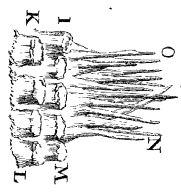


Fig. 13.



Fig. 14.



Fig. 15.

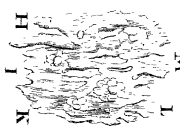
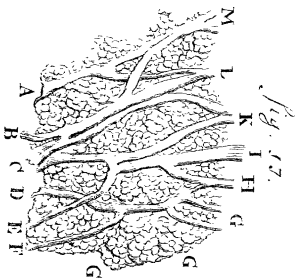


Fig. 16.



Fig. 17.



PHILOSOPHICAL TRANSACTIONS.

For the Months of May and June, 1708.

The CONTENTS.

- I. *An Account of the Repetition of an Experiment, touching Motion given Bodies included in a Glass by the Approach of a Finger near its outside: With other Experiments on the Effluvia of Glafs.* By Mr. Fr. Hauksbee, F. R. S.
- II. *An Account of some Experiments touching the Electricity and Light producible on the Attrition of several Bodies.* By Mr. Fr. Hauksbee, F. R. S.
- III. *An Account of an Experiment of the different Densities of the Air, from the greatest Natural Heat, to the Greatest Natural Cold in this Climate.* By Mr. Fr. Hauksbee, F. R. S.
- IV. *Joannis Keill ex Æde Christi Oxon. A. M. Epistola ad Cl. Virum Gulielmum Cockburn, Medicinæ Doctorem. In qua Leges Attractionis aliaque Physices Principia traduntur.*
- V. *Microscopical Observations upon the Tongue; in a Letter to the Royal Society from Mr. Anthony Van Leeuwenhoek, F. R. S.*
- VI. *Part of a Letter from the Reverend Mr. W. Derham, F. R. S. to Dr. Hans Sloane, R. S. Secr. concerning the Migration of Birds.*

I. *An Account of the Repetition of an Experiment touching Motion given Bodies included in a Glass, by the Approach of a Finger near its outside : With other Experiments on the Effluvia of Glass. By Mr. Fr. Hauksbee, F. R. S.*

THIS Experiment having been but imperfectly made before, I thought a Repetition of such a surprising *Phænomenon* would not be unacceptable to the Society, seeing, not only the *Apparatus* was better adapted, but the Appearance was much more conspicuous. For it was observable, that after the Motion and Attrition had been continu'd about 2 or 3 Minutes, and then ceasing, the Threads within seem'd to hang in a careless Confusion, and were not Instantaneously erected, but in about 3 or 4 Seconds of Time they were so, every way towards the Circumference of the Glass, and seemingly with so much Stoutness, that a Motion of the Glass alone would give them no great Disorder : but that which was the most surprising, was to see a Motion given them by the Approach of ones Hand, Finger, or any other Body, at more than 3 Inches distance from its outward surface, notwithstanding the Threads within touch'd not the inward one. And it was farther observable, that after every Repetition of the Motion of the Wheel, and the new Attrition of the Glass, that the distance, at which the Threads might be mov'd, seem'd to be Increas'd. And I have since found that the Threads could have a notable Motion given them, by blowing towards the Glass with ones Mouth at 3 or 4 Foot distance ; by which means
the

the Air was put in Motion, and consequently the *Effluvia* of Glass were so too. And at another time, when I have suddenly clapt my spread Hands on the Upper and Lower Parts of the Globe, there has been such a Violent Agitation of the Threads within, as was very surprising, and continu'd so for some time. But how to Account for such Uncommon *Phænomena* seems very difficult. Yet give me leave to make some Observations on former Experiments of the like kind, which with Remarks on some others lately made, may in some measure solve that difficulty. The Experiment where the directed Threads on the outside of the Glass would fly the Approach of any thing, held near them, seems to me, that the Parts of the *Effluvia* are stiff, and continu'd, that when any part of them are pulst, all that are in the same Line suffer the same Disorder. So even in this Experiment (I have just now been relating) allowing a *Continuum* of Parts, (as I see no reason to the contrary) the *Effluvia* within, and those without, are all of a Piece, (for they are both begot by the same Attrition) that when the *Effluvia* are pulst, or disturb'd without, the *Effluvia* within, in the same direction are so too, and consequently the Threads which are upheld and directed by 'em. The *Effluvia* which are provok'd from the Glass, seem to be, and are nothing else but part of the same Body exerted from it by rubbing; therefore (I think) can be no Impediment to the Motion of its own *Effluvia*, for otherwise I do not see how the *Effluvia* within, can be produc'd by an Attrition without. And for a farther Confirmation that the *Effluvia* of Glass act not but in a *Continuum* of their Parts, take the following Experiments.

E X P E R I M E N T I.

I took a piece of Leaf Brass, and laid it between two pieces of Wood about an Inch in thickness, and the same distance asunder. Then I apply'd a well rubb'd Tube to attract the Brass, even so near as the Wood would suffer, but gave it no manner of Motion; but so soon as the Wood was remov'd, and the *Continuum* of its Sphere restor'd, the Brass was driven to it very vigorously, without any truth Attrition; which I think most plainly proves, that the Action of the *Effluvia*, or at least in a great measure, is lost, if the Parts of it are discontinu'd by any thing Interposing, or Interrupting its Spherical Figure. Nay, I have try'd, by holding the Tube so, that its Sphere might meet with no Interruption by the Wood in its Circle round the *Axis* of the Glass, yet this would exhibit nothing neither; by which I find, that if the Parts of the *Effluvia* are in a manner interrupted, their Action is lost, or at least mightily impair'd.

E X P E R I M E N T II.

Again, after the Tube had been fresh rubb'd, and the Leaf-Brafs scatter'd on the Table as usual, if a piece of Paper was held to touch the upper part of the Tube, it would not attract at all, altho' approach'd very near; but so soon as the Paper was remov'd, it recover'd its Sphere of Activity, which was very sensible, by giving a brisk motion to those Bodies, which just before were Quiescent: And it may be remembred, that it is mention'd in the Experiment for producing Light by the *Effluvia* of the outward Glass falling on the inward exhausted Glass in Motion, that after the Motions were ceas'd, it was but approaching one's Hand near the Surface of the outward Glass, to produce a Light in the inward one: Whence, by these Experiments 'tis plain, the *Effluvia* within were pusht more vigorously on the inward Glass, by the approach of the Hand without, otherwise no Light would have ensu'd. And farther to prove the stiffness of the Body of the *Effluvia*, 'tis observable, that when a piece of Leaf-Brafs is hunted about a Room, that the Brafs swims or floats on the Surface of the *Effluvia*; and as that is more or less exerted, so the Brafs keeps its distance from it, nor will by any means be suffer'd to sink within it's Sphere, unless it meets with a Body in its way, and then it is attracted and return'd again several times with great swiftness.

E X P E R I M E N T I I I .

Having try'd the Effect of the discontinuing or interrupting of the *Effluvia* of the Affricated Tube on its outward Surface, I was willing to try what would ensue, by filling its Cavity with a Body, which I did, by plugging up one end of it with a Cork, then pouring in at the other dry Writing Sand till it was near full : After that, the Attrition was diligently made, and when held towards the pieces of brass as usual, no motion was given, till it arriv'd within an Inch or thereabouts of them. And thus on several Trials it answer'd much alike. And if at the same time the Sand be shot suddenly out, the Tube will attract the same Bodies at double or treble the foremention'd distance, without any fresh Attrition ; which plainly shews, that altho' the Tube will attract when approach'd near, yet the Body within is a sensible Impediment to the Extention of its Action without. This brings to my mind the unsuccessfulness of the Attempt I made to attract Bodies with a Tube exhausted of its Air ; which seems to conclude, there being no Air within, to bear the *Effluvia* from its Body, a *continuance* of their Parts must consequently be prevented,

Now how far these Experiments and Observations serve to Account for the premention'd *Phæ. phenomenon*, in Relation to the Motion given Bodies within the Glass by the approach of a Body towards its outside, I leave wholly to this *Honourable Society* to determine.

II. *An Account of some Experiments, touching the Electricity and Light producible on the Attrition of several Bodies.* By Mr. Fr. Hauksbee, F. R. S.

According to the Commands of the Society, I have made the following Experiments.

I caus'd a piece of Wood to be turn'd into the form of a short Cylinder, it being about four Inches Diameter, and three in length. This being fixt on an Axis, I melted in a Ladle about a Pound and half of the best Sealing-Wax I could procure, and when it was fluid, I plung'd the Wooden Cylinder into it, where I kept it moving round till it had got a Coat of it about half an Inch thick on its Surface, (I mean that part of it which is most remote from its Axis :) when it was perfectly cold, I plac'd it on the Machine, which gave Motion to it by a large Wheel (as usual in the Experiments on the Attrition of the Globe Glass;) after the Motion and Attrition had been continu'd some small time, I held the Hoop of Threads over the Cylinder, which were attracted and directed towards its Center, as in the like Experiment made with the Globe Glass. The Threads likewise, while they remain'd directed, would fly the Approach of a Finger. Thus in all Respects relating to Electricity, the *Effluvia* of Wax seems very agreeable to those producible on the Attrition of Glass: For on rubbing a Stick of the same premention'd Wax, the Leaf Brass would be attracted, and return'd with great Velocity ;

and sometimes a Piece of the same Brass might be carried all about a Room, seemingly riding or floating on the Surface of its *Effluvia*. In short, I find no difference in the Laws of the different *Effluvia*, tho' those of Glass seem to be much the strongest, and to act with the greatest Vigour. Thus far the Day light Experiments.

Upon the Approach of Night, I caus'd the same Motion to be given to the Wax Cylinder (begging leave to call it so) as I had done in the Day time, to see what Light might then be produc'd on the Attrition of it. I apply'd some clean new Flannel on it, but could discover little or no Light; yet afterwards upon holding my naked hand, as usual, on the Glass Globe, a considerable Light was visible, tho' only where the Attrition was made, nor would it live any longer than the Motion. I try'd if a Light would be communicated to one's Finger approacht near it, (as in the Experiment of the premention'd Glass;) but could obtain no such Appearance without touching it. This in a great measure bespeaks the Weakness of its *Effluvia*. I likewise have try'd what Light might be produc'd from it, by giving Motion to it in *Vacuo*; and altho I was forc'd to use Flannel there, yet a very distinguishing Light appear'd on each Arm of the Brass Spring that gently embrac'd it; and doubt not, but if my Hand could be made use of to rub the Wax in such a Medium, the Light would have been much greater: For the Light produc'd upon the Attrition of the Flannel on the Wax in *Vacuo*, was rather better than that which was produc'd upon the Attrition of it with my naked Hand in common Air.

From all which Experiments it appears to me, that the largeness or littleness of Light or Attraction, producible from Bodies by Attrition, proceeds from the Number and Strength of their Respective *Effluvia*, and so of all Bodies reciprocally falling under the same Classis.

Now

Now whether these several *Phænomena* are attributable to the Quality of the *Lac*, or *Vermillion*, (which I take to be the sole Compound of the Wax;) or, whether the Mixtion of both these Bodies is absolutely necessary in the Production of these Appearances, is worthy Enquiry.

A Continuation of these Experiments.

I have farther pursu'd the Experiments on the Electricity of different Bodies in the following manner.

I caus'd two Wooden Cylinders to be turn'd, of the same Dimensions as mentioned in the Experiment of the Sealing-Wax; and in the same manner as in that, I coat'd their outward Surface, one with melted Sulphur, the other with Colophony or Rosin mixt with Brick-dust, (which was put into it on purpose to bind and make it more hard; and first the Cylinder, which was clothed with the melted Sulphur, I first to give Motion to it as usual in Experiments of this kind; and after my Hand had been held out a little while, I caus'd the Motion to be stop't, then bringing near it the Hoop with Threads, mention'd in former Experiments, the Threads were attract'd and directed to its Center, but nothing so strongly as to the Sealing-Wax. And this upon several Try's was much the same. Then I try'd the Rosin in the same manner, and found the Electrical Quality in that much stronger than the former: For the Threads were driven towards its Center, seemingly with greater Vigor than that of the Sealing-Wax; but the Rosin at that time was not quite cold from its being melted. In both these Experiments the Threads would fly the Approach of one's Finger; but if Sealing-Wax or Amber were held near them, they would very eagerly fly and adhere

adhere to them without being rubb'd ; and that is what I never took notice of before. I farther observed, that the Rosin, while warm, would attract Leaf-Brass at an Inch or two distance without any Attrition. But next day when I came to repeat the Experiment, its Electricity was so inconsiderable, as well as that of the Sulphur, that I did not think them worthy to trouble the Society with the sight of 'em, altho the knowledge of their Performances may not be altogether unnecessary. At Night I try'd what Light these Bodies would afford on their Attrition in the Dark, but could produce none from the Rosin, nor indeed but very little from the Sulphur, and that not by my hand, but by holding the ends of my Nails very hard on it while it was in motion. I try'd likewise whether the Sulphur would emit any Light by its Attrition in the Dark in *Vacuo*, but could discover none altho diligently endeavour'd.

The most surprising of all Experiments that I have met with yet, are the following.

I took my Glass Globe that I use for shewing the Experiment of the included Threads, which would point every way from the Center to the Circumference upon the Attrition of it ; and in that state a Motion might be given those Threads, by the Approach of one's Hand near its outside. But this proceeded from the *Effluvia* of its own Body exerted by rubbing, therefore not so much to be wondred at. But that those Threads contain'd in the same Globe, should have motion given them by the *Effluvia* of an Heterogenious Body separate from it, and the Globe at the same time to have no manner of motion or Attrition given it, is very amasing ; and that it is so, is matter of fact. For when I held rubb'd Sealing-Wax near the outside of the Globe, the Threads within would have motion given them in a very astonishing manner, altho' the Body of Wax touch'd not the Glass by 3 or 4 Inches. The like I found might be perform'd

form'd by a rubb'd Glass Tube, or by Amber ; and if the Threads were plac'd in a Bottle well cork'd up, or any other close Glass, I suppose it would answer the same. This Discovery was made this day, being the 23d of June, 1708. and I doubt not but to carry it farther than what I here now give an Account of.

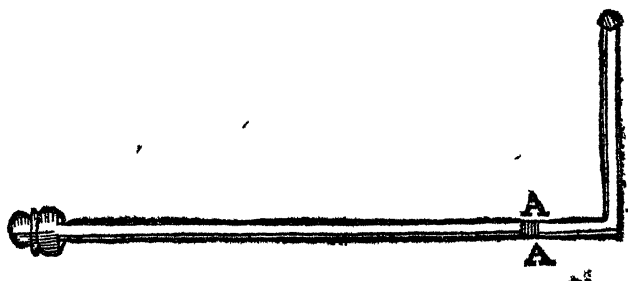
P O S T S C R I P T.

I have since repeated this Experiment with Leaf-Brass cover'd with a Glass Dish on a Table, and it was observable, that (altho' the Dish was very thick) upon holding the well rubb'd Sealing Wax over it the Pieces of Leaf Brass within would have a brisk Motion given them, and continue so a considerable time, ere the Wax would require any fresh Attrition. But this Appearance will not always succeed ; for some time after endeavouring the same Experiment, I could by no means make it answer as before : The Temperature of the Air being then alter'd, its moist *Effluvia* were condens'd on the Glass ; and so long as it remain'd under such Circumstance, it was attempting it in vain. But I found, that if the Glass was a little warm'd by the Fire, or plac'd a while in the Sunshine, or well rub'd with a warm dry Linnen Cloath, any of which, whereby the Humid *Effluvia* might be evaporated, that then the included Pieces of Leaf Brass would, from the attrited Wax, have as brisk a Motion given them as before. Now, whether the Fire, Sunshine, or the rubbing the Glass with a warm dry Linnen Cloath, not only clears it from the moist *Effluvia* condens'd on it, but likewise gives motion to the Particles of the Glass itself : Which Motion seems to produce *Effluvia*, which in conjunction with that of the Sealing-Wax, facilitates its Action on the premention'd Bodies ; and that it does
so

so, I conclude from this Particular: That when I had warm'd the Glass by the Fire, or had evaporated the Humid *Effluvia* by any of the other means, I found I could give Motion to the included Brass Bodies, by only rubbing my hand on the outside of it, without the assistance of the Wax. But at such a time when the well rubb'd Wax was held over it, the Motion of those Bodies would be much increas'd; and 'twas observable, that sometimes the Brass Bodies would continue to be in Motion, after the Wax was withdrawn from them. But if the Air be naturally warm, and free from Humid Vapours, there needs none of the prementioned means to assist the *Effluvia* of the Wax to give Motion to the included Brass Bodies: Yet at the same time I must believe, that the Particles of the Glass are then in a greater Motion, than when the Experiment will not succeed. And 'tis very probable I had never discovered this odd *Phenomenon*, had I first attempted it at an improper Temperature of the Air; which will caution me another time in Experiments of this Nature, not to conclude till I have had recourse to such helps as just now related. What farther I have to take notice of is, that the *Effluvia* of the Wax may very sensibly be felt on the Back of the Hand, the Wax being mov'd to and fro near it, as I have formerly taken notice of the like sensible Stroaks given by the *Effluvia* of Glass.

III. *An Account of an Experiment touching the different Densities of the Air, from the greatest Natural Heat, to the greatest Natural Cold in this Climate.*
By Mr. Fr. Hauksbee, F. R. S.

I Took a Glas Tube about 2 Feet in length, and near two tenths Diameter; which at about 6 Inches from one end, I bent in form of a Syphon, as represented by the Figure: at whose end, which was farthest distant



from the Angle, I cemented on a Brass Screw with a small Perforation in it; by which means, when I put a little Quicksilver into the shorter Leg, I could by declining the Tube, or longest Leg, bring it to rest any where; as suppose at A A. the superfluous Air within passing the premention'd Perforation. Then screwing a Cap on it, the Mercury was detain'd in the same Place, and posselt in length about half an Inch. In this manner it was convey'd into a Wooden Trough, with a Thermometer: Then putting in as much warm Water as would cover its Ball, the Syphon lying at Bottom in an Horizontal Position,

Position, its shorter Leg appearing above the Water, (which was purposely so contriv'd to prevent any Inconvenience that might arise by the Waters getting into it, and to give a free liberty for the pressure of the outward Air to exercise its full power.) When the Spirit of Wine had ascended by the heat of the Water into its small Ball on top, which I thought was necessary, that I might make my Observations with the more exactness upon its Descent; supposing by that time it should fall to the Degree design'd to begin at, that the Spirit in the Ball, would have receiv'd an equal Degree of heat in all its Parts. Accordingly I began my Observations, when it had descended to 130 Degrees above the Freezing Point; at which time, I found the length of the Column of Air, from the closed end of the Syphon, to the nearest Surface of the Quicksilver, to be just 144 tenths of an Inch. After the Spirit had descended 10 Degrees lower, the Air, which before possess'd 144 Parts, lack'd one of them now; and so on successively at every 10 Degrees descent of the Spirit, the Column of the contain'd Air was lessen'd in its length one exact tenth. When it had descended to 30 Degrees above the Freezing Point, the Air was found to possess but 134 of the prementioned Parts: So that from hence it will be easie to conclude, that at the Freezing Point, the Air in the Syphon would be reduc'd to 3 tenths less than the last Observation. And consequently at 50 Degrees below the Freezing Point, (which I am inform'd is the greatest degree of Cold that has happen'd in our Climate,) it would be reduc'd to 126 Parts of the whole, and in that state would be one eighth more dense than when at the greatest Degree of our Natural Heat: and the Reason why I could not prove this latter part by Experiment was, that when I came to expose the Thermometer and Syphon in the open Air, or Freezing Mixture, the Syphon would instantly

stantly receive the Impression of the Cold, and the Air contain'd in it be considerably contracted, before the Thermometer gave any sign of such Alteration. But seeing the former part of the Experiment succeeded so exactly regular, I think there can be no doubt of the truth of the whole Calculation, which yet I do not see how better to be perform'd. I shall add a Table of the different Degrees of the Airs density at every 10 Degrees. from 130 above the Freezing Point, to 50 Degrees below it.

This Experiment was made *February* the 11th, 1703, the Mercury in the Barometer at the same time standing at 30 Inches

	Degrees.	Parts	
Above.	130	144	1
	120	143	141
	110	142	1
	100	141	22
	90	140	1
	80	139	42
	70	138	7
	60	137	34
	50	136	1
	40	135	280
	30	134	1
	20	133	24
	10	132	1
	0	131	295
Below.	10	130	5
	20	129	144
	30	128	1
	40	127	1300
	50	126	1

Freezing
Point. }

The 2d Column shews the extent of the Air at the several Stations, from the Greatest Heat, to the Greatest Cold.

This Table shews the Difference of the Airs Density at every 10 Degrees, from 130 above the Freezing Point, to 50 below it. As supposing the Spirit in the Thermometer should stand at 40 Degrees above the Freezing Point; I find right against it in the third Column $\frac{1}{18}$: Its State being then so much more dense than when the Spirit is elevated to 150 Degrees. And so of all the rest.

IV. Joannis Keill ex *Æde Christi Oxon. A. M.*
Epistola ad Cl. virum Gulielmum Cockburn,
Medicinæ Doctorem. In qua Leges Attractionis
aliaque Physices Principia traduntur.

CUM summâ benevolentia, & non vulgari Amicitia me complexus sis, Iniquus essem, vir ornatissime, nisi conarer aliquam tibi vicissim referre gratiam. Theoremata igitur hæc, quibus non modo rem Physicam sed & Medicam aliquatenus illustrari posse arbitror, ad te mitto; munus, uti quibusdam fortasse videri potest, perexiguum, Tibi tamen & gratissimum fore spero, & non parvi æstimandum. Cum enim tum Philosophiam Mechanicam penitus perspexeris, & in Praxi Medicâ felicissimè sis versatus; tum etiam utrique promovendæ graviter incumbas, Gracissima sine dubio tibi erunt vera Medicinæ Principia, quoniam optime intelligis, quam periculosi ex falsis oriantur errores. Hæc igitur Theoremata tibi, Vir Clarissime, in manus trado, tuoque arbitrio libens permitto.

Ponenda sunt fundamenti loco hæc tria, quibus omnis Physice innitur, principia. 1. Spatium inane. 2. Quantitatis in infinitum divisibilitas. 3. Materie vis Attractrix. Dari spatium inane constat ex motu corporum. Quantitatis in infinitum divisibilitatem ex continuæ quantitatis natura demonstrant Geometræ. Materie inesse vim attractricem confirmat experientia. Ex duobus primis principis sequitur

T H E O R E M A I.

Materia exigua quolibet particula potest ita spatium quantumvis magnam occupare, ut pororum seu omnium meatuum diametri sint dati recti minores, vel ut particulae omnes sint à se invicem remotæ intervallo dati recti minore.

T H E O R. II.

Dari possunt duo corpora mole equalia, at pondere seu densitate (id est quantitate materiae) utcumque inaequalia, in quibus erunt meatuum seu pororum summae fere æquales.

Sit V. G. digitus cubicus alter auri, alter aeris: quamvis materia in cubo aureo vicesies millies superat materiam in cubo aërio, fieri tamen potest ut spatia vacua in digito cubico auri sint fere æqualia spatiis vacuis in digito cubico aeris, scil. ut auri vacuitates sint ad vacuitates aeris ut 999999 ad 1000000.

T H E O R. III.

Particulæ quæ aquam vel aerem vel alis ejusmodi fluida constituunt (simodo se tangant) non sunt absolute solidæ, sed ex aliis compositæ particulis multos meatus & poros intra se continentibus.

Particulæ corporum minimæ & absolute solidæ, hoc est vacui omnino expertes, vocentur primæ compositionis; Moleculæ ex pluribus hisce particulis coalescentibus ortæ vocentur particulæ secundæ compositionis; Moles ex pluribus moleculis coeuntibus conflatæ, vocentur particulæ tertiæ compositionis; & sic deinceps, donec tandem

dem perventum fuerit ad particulas, è quibus corporum fit ultima compositio, & in quas eorundem fit prima resolutio.

Materiæ inesse vim Attractricem, quâ omnis materiæ particula trahit ad se omnem aliam materiæ particulam, & vicissim trahitur primus ex Phænomenis collegit Dominus Newton. Vis hæc datâ materiâ in diversis distantis reciprocè proportionalis est quadratis distantiarum; ex quâ oritur vis illa quam Gravitationem dicimus, quâ corpora omnia terrestria ad terram rectâ feruntur, estque pondus corporum quantitati materiæ semper proportionale. Prolatâ hâc, quam ipse primus dedit, Materiæ vi Attractrice omnes Planetarum motus cometarumque Phases puercherimè explicavit, Physicamque cælestem, ab iis quæ tot retro fluxerunt sæculis vix dum inchoatam, felicissimè consummavit Dominus Newton; vir ingenio pene supra humanam sortem admirabili, dignusque cujus fama per omnes terras pervagata, cœli quos descripsit meatibus permancat cœva.

Divina sagacissimi viri inventa sæp. numero mecum recolens in eam tandem cogitationem incidi, principium quoddam Newtoniano non absimile, ad Phænomena terrestria explicanda, adhiberi posse. Post iterata sæpius experimenta, materiæ Terrestris inesse deprehendi vim quamvis attractricem, ex qua plurimorum Phænomenon ratio petenda est; Meaque hâc de re cogitata, abhinc quinquennio, Domino Newtono indicavi; ex eo autem intellexi, eadem fere, quæ ipse investigaveram, sibi diu ante animadversa fuisse. Quæstiones aliquot ad hanc vim attractricem spectantes, sub finem Optices abhinc biennio Latine editæ, proposuit Dominus Newtonus; quem cum istiusmodi studia ulterius excolere ætas ingravescens, & alia negotia vetant, tanti viri vestigiis insistere, eum cuncto longo licet intervallo sequi, haud alienum duxi. Imprasentiarum nuda quædam proponam Theoremata, quæ
fortasse

fortasse aliquando fufius enunciatâ & demonftrata, juſto volumine ſum traditurus.

THEOR. IV.

*Pæter vim illam Attraſtricem, quâ Planetarum Cometa-
rumque cor ora, in propriis orbitis reincentur, alia eti-
am ineſt m^ulti-plex potentia, quâ ſingulæ, ex quibus illa
conſtat, particulæ ſe invicem attrahunt & reciproci à
ſe invicem attrahuntur: quæ vis decreſcit in majore quam
duplicatâ ratione diſtantiæ augeſcentis.*

Theorema hoc multis poteſt probari experimentis; at ratio quâ minuitur vis illa, dum à ſe invicem recedunt particulæ, num ſcilicet ſi triplicata, quadruplicata, vel alia quævis diſtantiarum augeſcentium ratio, quæ major ſit duplicatâ, nondum æquè per experimenta patet; erit fortaſſe aliquando tempus, cum accuratiore adhibitâ diligen- tiâ innotefcet.

THEOR. V.

*Si corpus conſtet ex particulis, quarum ſingulæ vi pollent attraſtrice, in triplicatâ vel pluſquam triplicatâ ratione diſtantiarum decreſcente; erit vis qua ab eo corpore urgetur corpusculum, in ipſo contactu, vel intervallo à contactu infinite exiguo, infinite major, quam ſi corpusculum illud ad datam à dicto corpore diſtantiâ locaretur.**

* Vide Prop.
80. & 91.
Princip.
Newtoni.

THEOR. VI.

Iſdem poſitis, ſi vis illa attraſtiva in aſſignabili diſtantiâ, ad Gravitatem obtineat rationem finitam; eadem in ipſo contactu, vel in diſtantiâ infinite parvâ, vi Gravitatis erit infinite major.

THEOR.

T H E O R. VII

Si verò in ipso contactu, vis corporum Attractiva ad Gravitatem obtineat rationem finitam, erit et in omni distantia assignabili et non quæ sit in infinitum minor, et deoque evanescit.

T H E O R. VIII

Vis Attractiva, quæ polleat longè et brevè, et in ipso contactu, vis gravitatis ipsius non sit minor, sed sit in infinitum minor, et deoque evanescit.

Vis igitur hæc materiæ superaddita, non nisi per spatia admodum perexigua diffunditur; in majoribus distantis prorsus nulla est; unde motus corporum Cœlestium (quæ longis intervallis à se invicem disjuncta sunt) per vim hanc Attractivam nullâ ratione turbari possunt, sed eâdem ratione continuò peraguntur, ac si vis illa à corporibus is prorsus abesset.

T H E O R. IX.

Si corpusculum aliquod corpus tangat, vis quæ urgetur illud corpusculum, hoc est, vis qua cum eo corpore coheret, erit quantitati contactûs proportionalis; nam partes à contactu remotiores nihil conferunt ad cohererentiam.

Adeoque pro vario particularum contactu varii oriuntur coherentiæ gradus; omnium autem maximæ sunt vires coherentiæ, quando superficies, in quibus se invicem tangunt corpora, planæ existunt; quo in casu, cæteris
P
paribus,

T H E O R. XII.

Si ea sit corporis ciliujus textura, ut per facile ultimam compositionis, per eam quantumlibet extensare (qualis est principis eas commigrans, vel ut altero corpore procedens idem) à primigeniis suis contactibus paululum dimoveantur, nec interim in novos contactus commigrent, particule; per vim attractivam sese mutuo præter, ad contactus primigenios cito redibunt: istius vero reduntibus particularum corpus quodvis componentium contactibus & positionibus, eadem quoque redibit corporis figura; adeoque per vim attractivam corpora, præstas quas amiserant figuras possunt denno recuperare.

Hinc Elasticitatis ratio reddi potest. Cum autem per vim Elasticam corpora, in se invicem impingentia, à se mutuo resiliant (uti demonstratum est in Lectionibus nostris Physicis) à vi attractivâ corporum citi etiam debet eorundem à se invicem discessus.

T H E O R. XIII.

Quod si ea sit corporis textura, ut particule à prioribus contactibus per vim impressam dimotæ, in alios qui ejusdem sunt gradus immediate deveniant, corpus illud in pristinam figuram non se restituet.

Hinc qualis sit textura, in qua corporum molities consistit, intelligi potest.

T H E O R. XIV.

Particulæ ultimæ compositionis ipsarum structura. & compressione diuersis pollebunt viribus attractivis, quæ a se erit æquæ fortis attractio, cum particula data maximè diuersis pluribus perforata sit meatibus, ac si omnino solida & vacui expers esset.

T H E O R. XV.

Particularum perfecte solidarum vires attractivæ exiguae ipsarum multum pendent, Nam si parva aliqua materię particula in laminam circula rem indefinite exiguæ crassitudinis formetur, & corpusculum in rectâ per centrum transeunte & ad planum circuli Normali locetur; itque distantia corpusculi æqualis decimæ parti semidiametri circuli: vis qua urgetur corpusculum tricesies minor erit, quam si materia attractens coalesceret in Sphæram, & virtus totius particulæ ex uno quasi puncto Physico diffunderetur. Quin etiam eadem circularis lamella fortius ad se trahit corpusculum, quam alia ejusdem ponderis particula, quæ in tenuem & longum formatur Cylindrum.

T H E O R. XVI.

Sales sunt corpora, quorum particulæ ultimæ compositionis magni vi attractivi pollent, inter quas tamen particulis plurimi interjacent meatus, particulis, quas habet aqua, ultimæ compositionis pervii: quæ igitur a salinis particulis fortiter attractæ, in eas cum impetu ruunt, & à mutuo contactu eas disjungunt, coherentiamque salinæ dissolvunt.

T H E O R.

T H E O R. XVII.

Si corpuscula duo viribus attractivis decrescentibus in triplicati aut plujquam triplicati ratione distantiarum j. mutuo petunt; erit velo ita in se invicem invirgentium infinite major quam in dato intervallo. Vide Prop. 39. Princip. Newtoni.

T H E O R. XVIII.

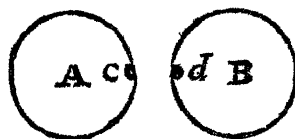
Corporis aqvi gravioris eo usque diminui potest magnitudo, ut tandem in aqua suspensum maneat, nec vi propria Gravitatis descendat.

Hinc patet ratio, cur particulæ Salinæ, Metallicæ, & aliæ ejusmodi, in minima redactæ, in suis menstivis suspensæ hæreant.

T H E O R. XIX.

Corpora omnia minime velocitate ad se invicem accurrunt, quæ in æthere.

Vis enim, quâ se mutuo petunt corpora A & B, particulis maxime propinquis tantum inest; remotiorum quippe vires nullæ sunt. Non igitur major vis adhibetur ad movenda corpora A



& B quam ad particulas c & d movendas, sed corporum eadem vi motorum velocitates sunt corporibus reciproce proportionales: unde erit velocitas quâ corpus A tendit versus B, ad velocitatem, quâ particula c, à corpore soluta, versus idem B tenderet, ut particula c ad corpus A.

Multo

Statio igitur minor est velocitate corpori. A quibus autem velocitas particulae est in potestate sua.

Et hoc est, ut corpus tam in ignem motum suum statim accendat, & lentus sit, ut in aqua motu illo se alius corpore non immolet, sed periculosus praeteraque impeditur. In mineralibus vero corpusculis videtur virtus, & ab his peculiariter producantur effectus: tanto plus Energiae mineralibus inest, quanto minus, quam majoribus.

Hinc videtur ratio istius Anomaliae Gaymici, Salis non agant nisi soluti.

T H E O R. XX.

Duo corpuscula sese non contingunt, alio sibi vicina locis possunt, ut videtur, quod se non contingunt, cum Gravitatis nihilum superent.

T H E O R. XXI.

Si corpusculum in fluido locatum à particulis ambientibus undique aequaliter trahatur, nullus exinde oritur corpusculi motus; quod si ab aliis particulis magis, ad alios minus trahatur, ad eam partem tendit corpusculum, ubi major est attractio: Et motus productus in quantitate attractionis respondet, scilicet in eadem ipsa quantitate major erit motus, et minor minor.

T H E O R. XXII.

Corpuscula in fluido natantia et magis se invicem trahentia quam fluidi particulae interjectas, depulsis fluidi particulis ad se invicem accedunt et vi, quae ipsorum attractio natua superat attractionem particularum fluidi.

T H E O R.

T H E O R. XXIII.

Si corpus aliquod in fluido locetur, cujus partes fluidæ particulas magis ad se trahunt, quam fluidi particule a se invicem trahuntur; sintque in corpore meatus plurimi particulis fluidi pervii, per hos meatus fluidum illud cito se diffundet; & si partium in corpore connexio non tam firma sit, quin ab impetu irruentium particularum superari possit, orietur exinde corporis immerfi dissolutio.

Hinc ut menstruum dato corpori dissolvendo sit idoneum, tria requiruntur, 1. Ut partes corporis particulas menstrui magis ad se trahant, quam eæ a se invicem trahuntur. 2. Ut corpus habeat meatus particulis menstrui patentes, & pervios. 3. Ut coheræntia particularum corpus constituentium tanta non sit, quin ab impetu irruentium particularum menstrui divelli possit. Hinc quoque constat particulas Spiritum Vini constituentes, magis a se invicem trahi, quam a particulis corporis salini in Spiritu Vini demersi.

T H E O R. XXIV.

Si corpuscula in fluido natantia, & se invicem petentia, Elastica sint, post congressum, a se mutuo resilient; & inde in alia corpuscula rursus impingentia, de novo resistentur: ex quo fient innumeri alii cum aliis corpusculis confectus continuæque resiliunt. Per vim autem attractivam continuo augentur corpusculorum velocitas, & sensui patebit partium motus Intestinus; sed prout fortius aut debilius se invicem trahunt corpuscula, & pro varia, quæ possent Elasticitate, variis erunt hi motus, & diversis gradibus atque temporibus, fient sensibiles.

T H E O R.

T H E O R. XXV.

Si corpuscula se invicem trahentia, se mutuo contingant, nullus oriatur motus ; propius enim accidere nequeunt. Si ad exiguum admodum a se invicem seporantur spatium, oriatur motus ; sed si longius distent, non majore vi se invicem trahent, quam fluidi particule inter se, adeoque nullus pro lucetis motus.

Ex hisce principiis pendent omnia Effervescentie & Effervescentiæ Phænomena. Hinc patet ratio cur statim Vitrioli, cui paululum aquæ immittitur, effervescentia atque ebullit : corpuscula enim salina infusa aquâ à mutuo contactu paululum dimoventur ; unde cum magis se invicem trahant quàm aquæ particulas, & cum uniusque æquali non trahuntur, motum exinde oriri necessarium.

Hinc etiam liquet ratio, cur tanta cietur ebullitio, cum Alimatura Chalybismixturæ supradictæ injicitur : particule enim chalybis magnâ pollent Elasticitate, unde valida oritur reflectio. Hinc etiam videre est, cur menstrua quædam fortiori vi agunt, citiusque corpus aliquod dissolvunt, si aquâ dilutiora fiant.

T H E O R. XXVI.

Si corpuscula se mutuo attrahentia vi Elasticâ carcant, se invicem non reflectuntur ; sed congeries seu molculas particularum efficient, unde fiet Coagulum : & si particularum sic coaccervatarum Gravitâs superet Gravitatem fluidi, succedet quoque Præcipitatio. Oriri quoque potest præcipitatio ex auctâ vel diminutâ Gravitâte menstrui, in quo natant corpuscula.

T H E O R.

THEOR. XXVII.

Si corpusculorum sese invicem attrahuntur, & in fundo natantur, ea sit figura, ut in his quibusdam ipsorum partibus, majori vi attractivæ possident, quam in alijs; & major sit in iisdem contactus; corpusculi illa coibunt in corpora datas figuras habentia, & inde emergent Crystallisationes; corpusculorumque componentium figuræ, ex datâ figurâ Crystalli per Geometriam determinari possunt.

THEOR. XXVIII.

Si corpuscula magis trahantur à fluidi particulis, quam se invicem; fiet ut quasi se mutuo fugientes, à se invicem recedant, & per omne fluidum citò diffundantur.

THEOR. XXIX.

Si inter duas fluidi particulas aliquod intercedat corpusculum, cujus binæ oppositæ facies maximis pollent viribus attractivis, hoc interjectum corpusculum particulas fluidi sibi agglutinabit; & plura istiusmodi corpuscula per fluidum diffusa ejus particulas omnes in corpus firmum compingent, fluidumque in Glaciem reducent.

THEOR. XXX.

Si corpus aliquod maximam emittat effluviarum copiam, quorum vires attractrices sunt fortissimæ; cum effluvia hæc corpori alicui leviusculo appropinquant, ipsorum vires attractrices Gravitatem corporis levioris tandem superabunt; & effluvia corpus illud ad se sursum trahent; cumque multo magis conferta sunt Effluvia, in minoribus ab emitte corpore distantis, quam in ma-

*coribus ; corpus leve versus densiora Effluvia semper ur-
gebitur, donec tandem ipsi corpori effluvia emittenti ad-
hæreat. Hinc plurima Electricitatis Phænomena ex-
plicari possunt.*

Contra nostram hanc de viribus attractricibus doctrinam, fortasse objiciet aliquis ; Si vis hæc attractrix omni inesset materiæ ; corpora ponderosiora & plus materiæ in dato spatio habentia, plus debere attrahere, quam corpora minùs Gravia, quod experientiæ repugnat. Sed huic objectioni facile responderetur. Particulæ scilicet ultimæ compositionis (quibus solis tribuitur vis attractrix) confertim juxta se invicem locatæ, possunt corpus ponderosum constituere, etiamsi ipsæ in se sint rariores, quam eæ quæ corpus leve constituunt ultimæ compositionis particulæ, à se invicem remotiores, & plures & patentiores meatus inter se habentes.

Alia multa sunt Naturæ Phænomena, quæ mihi videntur iisdem principiis explicari posse, uti ascensus succi in Plantis & Arboribus, foliorum & florum determinatæ & constantes figuræ, eorumque virtutes specificæ, &c. Multa quoque quæ in corpore animali quotidie occurrunt ; præcipue quæ ad fluidorum cursus Secretionesque spectant, ab iisdem materiæ qualitatibus pendent, & hinc morborum *Theoria* & medicamentorum effectus optime eruuntur. Quantum huic Usui inserviant hujusmodi Principia medicis innotescet ex eo, quod Frater meus nunc meditatur, Opusculo ; qui quidem Mathematicas cum Anatomicis rationes consocians in eo elaboravit, ut aliquam etiam Praxi Medicæ Lucem asferret.

V. *Microscopical Observations upon the Tongue ; in a Letter to the Royal Society from Mr. Anthony Van Leeuwenhoek, F. R. S.*

Delft in Holland, December 6. 1707.

AFTER I had satisfied my self concerning that Matter which is found upon the Tongue, and which we call the Thrush, I let my Thoughts wander a little further upon the Consideration of the Tongue it self, in order, if it were possible, that I might discover the Pores in the Tongue, by which that Matter is imbibed, which is afterwards protruded out of the Tongue : wherefore I did, as it were, reject or lay aside all my former Remarks about the Tongue, and having taken four distinct Tongues of Oxen or Cows, I set my self to examine the Skins of the same, and particularly the External Particles, that are upon the thickness of the Tongue, and where, as I conceive, is the place that admits the Juices into the Tongue, by which that Sensation is produced which we call the Taste. ——— I separated those aforesaid External Particles as well as I cou'd from those that lay under them, and observ'd that the latter, that is to say, the Internal were furnish'd with a very great number of pointed Particles, the tops of which, for the most part, were broken off, and remained sticking in the outmost Skin ; and it has often happen'd, that when I placed one of these Internal Particles of the Tongue before a Microscope, it appear'd to me, to be as 'twere a transparent Body, something larger than a Thimble, and I cou'd discover in it little Internal Holes or Cavities, thro' which a greater

quantity of Light was admitted : and by the other parts ; and I also inquired, that the Extream Parts of those Cavities had exceeding small Orifices in them.

Now that we may the better conceive an *Idea* of the Tongue, and of those rare Particles which are found in the middle part of the Tongue of an Oxe, I caused the Tongue to be drawn just as they they appear to the naked Eye, as you may see in *Fig. 1.* A, B, C, which Particles were a little bigger than they were upon the Tongue, because those were a little dried up.

Notwithstanding that I took a great deal of pains to separate the uppermost Skin from the Parts that lay under, to the end that I might view those latter intire and unbroken, yet I could not bring it to bear any farther, than as it is represented here in *Fig. 2.* D, E, F, G, H, I, in which I could only discover a few pointed Particles between G, H, and I.

Upon viewing with a Microscope that space of the Tongue, which is between the Protuberances, I observ'd, that 'twas all over cover'd with a great number of exceeding small rising roundnesses, that were so close to one another, that you could not put in two Hairs between them, as you see in *Fig. 3.* K, L, M.

Moreover I stripp'd off the *Superficie*, of the Tongue with a sharp Knife, and repeated the same a second time ; and then discover'd an unspeakable Number of little Holes, some of which seem'd to be fill'd, others were cut through length-ways.

Fig. 4. N, O, P, Q, R, S, represents one of the aforementioned thin Slices, in which we had discover'd divers small Holes ; the great Hole in the said Figure at T, is the place where there was a little Protuberancy like those in *Fig. 1.* and which had been cut off. At P, Q, and R, you may observe the place where a much greater Protuberancy had stood ; and the dark little Strokes or Lines between Q and R, are those Particles which were cut thro'

thro' length ways ; and the Particles that lie near them, are those that were cut a cross. ——— I did likewise separate the uppermost thick Skin of the Tongue from the parts that lay under, as well as I was able, to the end I might discover what those Particles were that were placed in the said Openings ; and at last I discover'd in the underlying Parts, a great number of long Particles, which I concluded to be as long, or something longer, than the thickness of the uppermost Skin, and that the Points of those long Particles were sheathed into the small little Cavities or roundnesses, described above by *Fig. 3. K, L, M.*

From this appearance I also imagined to my self, that when we press our Tongues against the Roof of our Mouth (in order to taste any thing,) the aforementioned long Particles, the ends of which are exceeding slender, press thro' the uppermost Skin, which at that place is also very thin, (or to speak more properly, is endued with small Pores or Holes) and so receives a little Juice ; from all which proceeds such a sort of Sensation, which we call Taste.

These long slender Particles appear'd so numerous, as we view'd 'em thro' a Microscope, that no Grass in the Field cou'd seem thicker to the naked Eye. See *Fig. 5. V, W, X, Y.* and at first they stood streight up an End, but by growing dry, they assum'd such crooked Figures as are represented between X and Y.

Sometime ago a certain Gentleman related, as a very wonderful thing, that the Oxen or Cows had their Tongues armed with very sharp Particles ; but I told him that that must necessarily be so, because those Beasts had no Teeth in the upper Mouth or Jaw, and therefore were forced to press the Grass with their Tongues against the Roofs of their Mouths, in order to break it to pieces.

These

These sharp Particles are Bones, that are bent or crooked a little, and the outward parts of them stand towards the inmost part of the Mouth, and the nearer they come to the thickest part of the Tongue, where those Particles are to be found that are represented by *Fig. 1.* A, B, C, the smaller they grow, and these Bony Particles have also a thin Skin over them.

I also caus'd a Hog-Butcher to bring me at several times divers Tongues of Hogs, and cut off the protuberant Particles which are found at the top of the Throat, and I caus'd one of those small Particles to be drawn by the Painter, which appear'd as large to him, as 'tis here represented in *Fig. 6.* between A and B.

I plac'd several of these protuberant Particles before a Microscope, and observ'd upon one of the Tongues other sharp pointed Particles sticking out of the forementioned protuberant ones; whereupon I caus'd it to be Painted, as it appeared to me, in *Fig. 7.* C, D, E, F, G; the most pointed part is at F, where it pierces thro' the uppermost Skin, and between E and G you may observe four lesser sharp Particles of the same Nature.

Fig. 8. H, I, K, L, M, represents likewise one of the foremention'd protuberant Particles of a Hog's Tongue, in which between K and L you may observe standing out three sharp-pointed Parts, and at M a fourth; and 'twas moreover all cover'd with the foremention'd Tumors or Roundnesses.

Furthermore, after several Dissections of the said Particles, I made a shift to separate the uppermost Skin of the said Particles, and viewing divers of them with a Microscope, I cou'd perceive that each of 'em were of a different Figure; but all agreeing in this, that they were arm'd with an unconceivable Number of painted Particles, which lay, as 'twere all involved or hid in the Skin; and these, as I imagine, are endued with a Power
(when

(when the Tongue is press'd against the Roof of the Mouth) to produce the Sensation of Taste.

Fig. 9. N, O, P, Q R, the vs you one of those Prominent Parts, as 'twas devested of its Skin, and as well as the Painter cou'd describe it ; and altho' the Points that stick out seem to be very blunt, yet I fancy if one were to see them in their true State and Nature, they would be very sharp ; and the reason why they don't appear so now, is that the Points are probably broken off, and remain sticking in the Skin.

A did likewise view the Tongues of Hogs in those Parts where there were no Protuberances, even to the end of the Tongue ; and with great wonder always discover'd a mighty Number of very slender long Particles, which always run into a sharp Point at the end, just as any Needles do appear to the naked Eye.

Fig. 10. S, T, V, W, X, represents a very small Particle of the Tongue, with three Protuberances on it ; which being dryed, appeared so standing out as is described, each of them having four pointed Particles, one of which at W, was standing out much higher than the rest ; all these unevennesses out of the Skin are occasion'd, as I conceive, by reason that the Parts, in which the said sharp-pointed Particles, are as 'twere riveted or fastned, lying lengthways, do not equally shrink in, in the drying.

After all this I took a very sharp Razor, and therewith cut off from the Tongue a few Slices as thin as I cou'd possible, and placed them before the Microscopes, in order to discover how the aforementioned pointed Particles lay in the Skin.

Fig. 11. A, B, C, D, E, F, G, represents one of those small Slices of the Tongue ; in which at D, E, F, I observed three sharp Particles ; and that which was described by E, had four pointed Particles together ; and who
knows

and therefore, the sharp Parts of the Tongue.

It is also to be observed, that the sharp Parts of the Tongue, which are cut off, and which appear, are not any Cavities; but white proceeds also from hence, that the Matter with which the Tongue was dyed in those Parts were not in the Pains, but at the end of several days they were cut off from the Tongue.

Therefore as those Parts of the Tongue are of equal bigness, not distand equally close to one another, I added to be drawn another little piece of the Tongue, as you may see in Fig. 12. where I K, L M, are the Partials from the very sharp Points cut off, and N O, the sharp pointed Particles themselves, which appear very plainly to the Eye.

Now when I stroked my Fingers upwards and downwards over that part of the Tongue, where the forementioned pointed Parts are found in great number, in order to discover the Sharpnesses thereof, I must own, that I could perceive no more roughness than if I had been feeling a piece of Velvet.

Now what I conceived, that a great number of slender sharp pointed Particles had no hard smoothness in them, I began to think whether most Particles that are represented in Fig. 11. by H, I, J, and in Fig. 12. by K, L, M, may not be in the Tongue when they are at rest, and forbear to exert their sharpness, or to thrust themselves out of the skin, but only at such times when the Sensation of Taste is to be exerted; for how can it be conceived, that such soft Parts should be able to withstand the violent motions which are produced in them by the Tongue, both in eating and other Occasions: Moreover it came into my Thoughts, that when the

the pain that is caused by the Vessels, might also force those Particles to come out of the place.

When I have seen a great many round protuberant circles, like the said Particles, the Diameter of which was as big as of those in *Fig. 11*, before the L. of the Skin came to dry, I could not see any way Places, the external or sucking Membranes draw upwards in each of them, which would take ten for Valves.

From this appearance I began to consider, whether those sort of Particles were not made for the clearing of the Tongue of its superfluous Matter, and the rather, because I had oftentimes observ'd, that those Vessels had nothing included in them, but a moistness which mostly evaporated, and left as twere an empty place behind it, which extended it self as far as the thickness of the Skin.

After I had brought my Observations thus far, I determin'd to separate the uppermost Skin from the Parts that lay under, which I brought to pass in small Parcels; and when I had divided such an uppermost Skin, I cut from it, (in that part where it had been united) with a sharp Razor, several Scaley Particles, which having placed before the Microscope, I observed with wonder a great Number of Holes or Cavities, which when they were placed opposite to the sight appear'd wider, but when removed from the sight narrower, so that each Cavity seem'd to be of the Form of a Tap or Funnel; and forasmuch as each of the said Cavities had, as it were, a Body fast about them, I concluded, that these were certainly those Parts which in *Fig. 11*. are described by H, H, or in *Fig. 12* by I, K, L, M, and that they were broken off from their bottom or part that lay under them.

Now the better to receive the aforementioned Parts, I caus'd a small Quantity of 'em to be drawn, as you may see in *Fig. 13.* between P, Q and R.

From these Discoveries I considered with my self, whether the whole shippointed Particles in *Fig. 10, 11, 12,* be separated out of those hollowneſſs that are represented in *Fig. 13.* For my further Satisfaction therefore I cut off a small Slice with a sharp Razor, from that part from which I had cut off *Fig. 13.* before, and placed it before a Microscope and observed, that for ſo many Cavities which I had found in *Fig. 13.* as many pointed Particles appeared in this, having their Roots, or being faſtned into a Fleſhy Subſtance lying under the uppermoſt Skin; and forasmuch as the laſt mention'd Particle with its Points ſtood oppoſite to the ſight, I cut off a ſmall Slice of it, and placing the pointed Particles uppermoſt, I caus'd it to be drawn as in *Fig. 14.* A, B, C, D, E, F, G, of which D, E, F, G, A, are thoſe Parts that are placed in *Fig. 13.* of which ſome are bent crooked, which I ſuppoſe is not their natural State, but what has been acquired either by my handling, or by their growing dry and ſhrinking; as alſo that the pointed ſharp Parts, represented in *Fig. 10, 11, 12.* are joyned together, and in the ſeparating of the uppermoſt Skin, the tops of 'em are either broken off, or remain ſticking in the ſaid Skin.

In *Fig. 14.* by A, B, C, D, is deſcribed a very ſmall part of the Fleſh of a Tongue, in which thoſe pointed Particles are as 'twere planted, and in which, the Painter could juſt perceive ſome roundiſh Particles, which he has repreſented as he ſaw them, and which Particles I conclude are Particles of Fleſh that were cut through acroſs.

I next turn'd my Thoughts to the Examining how the pointed Particles in *Fig. 14.* D, E, F, G, A, were diſpoſed in the parts of the Fleſh; whereupon, I cut acroſs the
Fleſh

Flesh of the Tongue in that part of it, where the pointed Particles are rooted in, and observed oftentimes, when I came to a pointed Particle, just where it was planted in the Flesh, it did consist of 7 or 8 Particles of Flesh, and sometimes more, that infinitated themselves between the parts of the Flesh of the Tongue; and the long Flesh Particles of the Tongue (which did not seem to surround the pointed Particles that are rooted in the Flesh) appear'd to be Analagous to those perpendicular Vessels in Wood, which do also, as it were, branch out into Horizontal Vessels, of which I have formerly given you an account.

Now when I observed that the pointed Parts described by E, F, G, in *Fig. 14.* did consist of several long Flesh Particles, I began to consider, whether each of those long Flesh Particles, did not end in such Points as in *Fig. 11.* are represented by D, E, F.

Fig. 15. H, I, K, L, M, represents a very small piece of the Tongue of a Hog, so as it appear'd through the Microscope, in which you may observe five particular Particles which had been cut through across; in some little Slices I have observed seven such roundish Flesh Particles: The long Particles, which are extended from L to K, and from M to I or H, and which encompass the foremention'd Particles, are the Flesh parts of the Tongue.

I did moreover cut through lengthways some of these pointed Particles, described in *Fig. 14.* by E, F, G, just at the place where they are fastned into the Flesh, in order, if it were possible, to discover how deep those Particles were rooted into the little Muscles of the Flesh, but I could prosecute my Design but a very little way.

I caused the Painter to draw one of those very small Particles, so as it appeared through the Microscope, and as it is represented by *Fig. 16.* N, O, P, Q, R; and where-as in the foregoing *Fig. 15.* the Flesh Particles are de-

Hundred Breadths of a Hair do not exceed the Diameter of one Inch; it follows, that one Diameter of that small Muscle is but equal to the Diameter of one Inch; and consequently that 60000 of the said small Muscles or Fibres make no more than the Circumference of one Inch.

These long Flesh Particles, which compose the Muscles of Flesh, are likewise themselves composed of abundance of smaller Particles; but how unaccountably small then must those Particles be, of which the whole Bundle is made up.

One must also consider, that these long Flesh Particles are not round, but each assumes such a Figure, as suits best to the others, to which 'tis joyned, and so as to leave no space nor Vacuity between them, insomuch that I have seen some of them that were in a manner of a Triangular Figure.

Now forasmuch as the Particles represented by *Fig. 15* and *16*, were in a manner dried away before the Painter could fix his Eye upon them, I bethought my self of an Expedient to place them before his Eye, even whilst they remain'd moist and plump.

Fig. 17. A, B, C, D, E, F, G, G, H, I, K, L, M, represents a small piece of the Tongue of a Hog, in which the pointed Flesh Particles that in *Fig. 14.* are described by D, E, F, G. A, appears to be coming out or rather joyned to and fastned in those parts which are shewn by G, H, I, K, L, M, and the Tips or Points of 'em are also broken off.

This little piece was cut off from a different part of the Tongue than the foregoing; and you must observe, that you may often cut Slices from the Tongue, without being so happy as to cut the Particles lengthways.

You may see how those forementioned Particles spread themselves amongst the vast number of little Flesh Muscles which are all cut across; and you may likewise perceive.

cence how the other Particles cut lengthways, and described by G, being divided into two Branches at the top, are joyn'd in one a little lower, and then afterwards divide themselves again, and so continue till they are cut off at F and D ; in like manner those Particles cut lengthways, and described by H, I, K, are presently joyned and soon after separated again, as you may see at C and I and again, other Particles of the same nature, represented by K, L, M, are united. and a little above B, C, are again disjoyned ; and between the said C and B, is another small Particle, which is also divided.

The Painter told me, that in drawing he could perceive Holes or Cavities in those Particles, which are described to be cut lengthways, but as I cou'd not be sure of that, I chuse rather to give them the name of Flesh Particles, whose inmost parts are as 'twere shrunk inwards ; and how many soever cuts I made in the Tongue, the *Phænomena* or Appearances thereof were always various, yea, so much that we were quite astonished at it, and if I cou'd represent them to any other Bodies Eyes in the same manner as I saw 'em my self, they would cry out, *What Wonders are these !*

Between those Flesh Particles that are cut thro' across, and which are surrounded by the other Particles that are cut thro' lengthways, you may observe, that several of them are distinguished from the rest by a darker Circle of the red Pencil, which Circle you must suppose to be little Membranes that encompass the small Muscles of Flesh, which small Muscles are likewise in part represented by G, G, G.

I have often thought that our Taste proceeds alone from the Tongue ; but within these few days, I am become of another Opinion ; for when I viewed that part of the Roof of the Mouth, opposite to the top of the Throat, where the notch'd or jagged parts of the Hog's Tongue are determined, I judged that that was the place
from

from whence the Head did partly discharge it self, and the Matter to be cast out, which comes into the Mouth without its proceeding from the Lungs; as also that there are a great many parts in it, which receive the Matter which we call the Taste: but this wants a further Enquiry.

VI. *Part of a Letter from the Reverend Mr. W. Derham, F. R. S. to Dr. Hans Sloane, R. S. Sec. concerning the Migration of Birds.*

'Upminster, April 1st. 1708.

I Remember that some time since, I promised to suggest a thing to the *Society* relating to the Migration of Birds, which I conceive may conduce to the Discovery of that pretty *Phænomenon*; and I am sorry I forgot it till the *Jynx* (just now come) hath brought it to my Thoughts. The Business I would humbly recommend is, That the Members of the *Society* all over the Realm, would themselves, or procure their inquisitive Friends to observe, and note down the very Day they first see or hear of the Approach of any of the Migratory Birds. And it may be convenient also to observe how the Winds sit at the same time, especially towards the Sea-coasts. The several Observations ought to be communicated to the *Society*. Which when compared together, we may probably make a good guess which way those Birds come, whether fromward the East, or any other Point. The *Jynx* or *Wryneck* (for instance) which I take to be undoubtedly a Bird of Passage, I first heard this Year on March 29, the Wind Southerly, or S. Westerly that and the preceding Day; but Easterly before. The *Certhia*

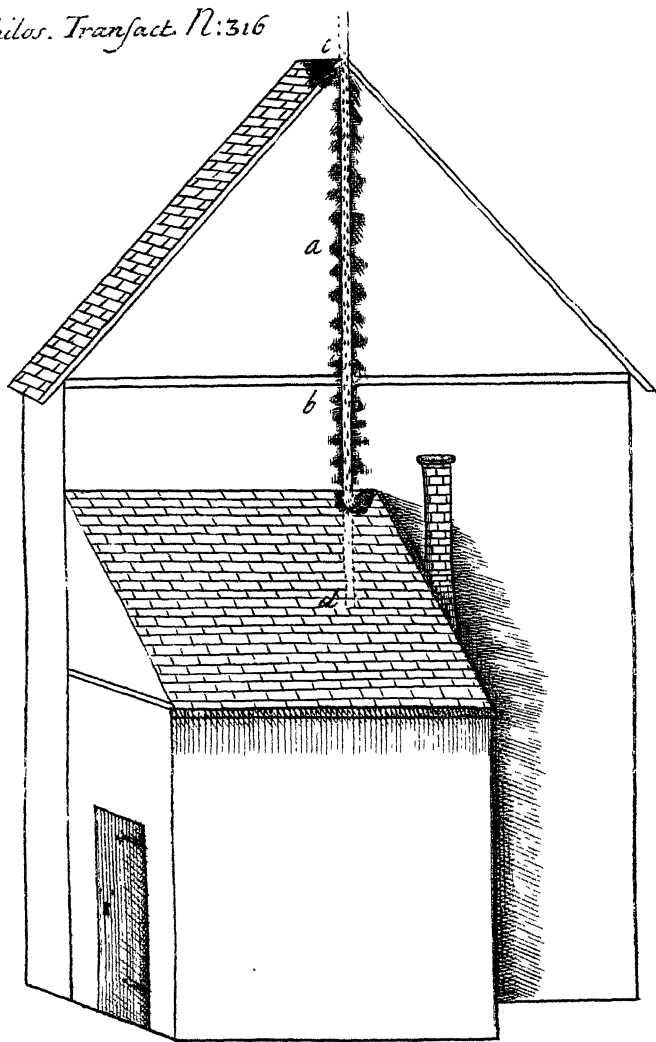
also.

also or C. *repe.* (which leaveth us in *Essex* until the Spring, but whether a Bird of Passage I can't tell, this Bird I say) I saw first on *March 23*, the Winds that Day varying from S to N. but blowing strongly the Day before from the Westward. Now if those Birds in the more Westerly, or any other parts, at 100 200 or more Miles distant, should be discovered to come sooner or later, we might conclude, that accordingly they came fromward the East or West, or other Point, especially if about the same time the Winds seemed to favour their Flight. These are all the Migratory Birds I have seen as yet this Year. But for a farther Sample I shall annex my Observations last Year, *viz.* The *Swallow* came *March 31*, making a great outcry at his Approach, as if he saw something strange. *April 1*, the *Jynx* first yelped here. *April 4th*, I first espied the *Ruticilla* or *Redstart*. The *5th* I saw the *Martin*. The *6th* the *Nightingale* first sang with us. The *7th* the *Cuckow* I was told was heard, and the *9th* I heard it my self. The *17th*, I heard the *Swift* or *Black-Martin* squeek in an Hole in my House, in which it hath quietly built for several Years: But it being cold Weather, he did not fly abroad till some Days after. As to the Coast of the Winds about those times, they may (if desired) be best seen in my Tables, which I will send you, &c.

L O N D O N,

Printed for *Henry Clements* at the *Half-Moon* in
St. Paul's Church-yard. MDCG VIII.

Philos. Transact N:316



PHILOSOPHICAL TRANSACTIONS

For the Months of July and August, 1708

The CONTENTS

- I. *Microscopical Observations on Reaumur's Insects, made at the Royal Society, from Mr. Anthony Van Leeuwenhoek, F. R. S.*
- II. *Part of a Letter from Mr. Ralph Thoresby, F. R. S. to Dr. Hans Sloane, R. S. Sec. concerning some Roman Coins found in Yorkshire.*
- III. *Part of a Letter from Orlando Bridgman Esq, F. R. S. to Capt. Wine; giving an Account of a Storm of Thunder and Lightning that happen'd at Ipiwich, July 1st. 1708.*
- IV. *A Letter from Mr. Jos. Nelson, concerning the Effects of the abovementioned Storm of Thunder and Lightning at Colchester.*
- V. *Part of a Letter from the Reverend Dr. Arthur Butts to John Chamberlayne Esq; F. R. S. concerning the Manner of Land in Devonshire by Sea and Land.*
- VI. *A Letter from Mr. Edward Lhuyd, Keeper of the Ashmolean Museum in Oxford, to Dr. R. R. in Yorkshire; giving an Account of a Book, Entituled, OYPER-
ZOOITHES Helveticus, sive Itinera Alpina Tria, &c. Authore Joh. Ja. Scheuchzero, M. D. Lond. 4to. MDCCVIII.*

I. Microscopical Observations on Red Coral : In a Letter to the Royal Society from Mr. Anthony Van Leeuwenhoek, F. R. S.

THIS brings you (pursuant to your own Request) some Observations which I made about two Years ago, concerning Red Coral, which are these that follow.

In a Letter of mine of the 29th of *December* 1705, I acquainted you how I had found some small Parts of Blood-Corral upon a little Scollop Shell, and upon a piece of a little *Horn*, or small Fish so called, and that I was of Opinion, that that Corral did not grow, but was only coagulated upon the said Shells.

I had formerly several times slit both in length and thickness Pieces of Blood-Corral, that were very fair and of a shining Redness, and cut off as thin Scaley Particles as 'twas possible for me to do, to the end that I might discover the Vessels in the same ; in doing which, I fancy'd to my self, that now and then I cou'd perceive some very small Orifices of the said Vessels, but they were so exceeding small, that I cou'd make no perfect Remarks of them, tho' I could easily observe, that in those Parts that I had cut thro' across, there ran such Fibres from the Centre to the Circumference, as are found in the Roots of underground Fruits ; and notwithstanding all my Endeavours, I cou'd not find any Pores in them, at least so as to say any thing certain of them ; but it seem'd to me, as if most Parts of the Corral were made up of roundish Particles, such as some
certain

main Fruits are compos'd of, but their roundness was such that each of them were in a manner of a 3^d Parture, such as might best suit with all the Sea, and to leave no Vacuity in them, and thus the Cells which are not in the Vessels, are convey'd from one of these round Parts to the other, and so serve for Cha-

I could never have thought, that the Parts of Red Coral were so closely united to another, as I have since discover'd; I know indeed, that the same Pieces of Blood Coral preserv'd as Rarities among many Objects, that are like little Trees with their Branches, fasten'd to Stones or other Substances, and pretend'd to be miraculously growing out of the same; but one is oblig'd to believe it, unless it could be proved, that such Corals had Roots and little Fibres proceeding from them, which if they did not peretrate into the Stone, must at least be so spread over the Surface of it, as to be obvious to the Sight.

I will rather suppose, that Corals are fasten'd to the Bottom of the Sea, as the Trees are to the Earth, these Plants or Corals, or the Branches thereof being broken off by the Coral Fishers, the thick End of them may accidentally fall upon a Stone, or some other Substance; and by reason of the aforesaid Softness, and of a Glutinous Matter with which it is endued, might very easily be fastened to the Stone, and afterwards People made to believe, that it is a Wonderful Concrecence from such Stones or other Substances.

I have two Pieces of Coral by me, that were no bigger than a Hen's Quill; I broke one of them into several Parts, and found in three places Cavities that took up more than half the space of the Coral it self: between these Cavities the Parts of the Coral were solid and close: In each of those Cavities there was a thin Membrance that one wou'd judge to be a bit of a
dry

... because the long Parts that appeared in the great Numbers, seem'd to be Canals or Vessels, ... upon a third Examination into the same, I judg'd them to be coagulated Salt Particles, and the rather, because they were flat at both Ends.

Now I must confess, it is unconceivable to me, how such Particles shou'd be found in the middle of the Corral especially if we allow that Substance to receive its Nourishment and Increase, after the same manner as other Plants.

For my further Satisfaction I took a little Piece of very fine Red shining Corral, and put it into the Fire and observ'd that a little heat caus'd the fine Redness to vanish, and turn'd it into an Ash-colour.

The Corral being in this condition, the Superficies of it still retains the same Smoothness, but under it the Particles seem'd like Ribs extended lengthways in the Corral, and viewing the same more narrowly, I observ'd, that the said Rib-like Particles compos'd a Circle or round Scales, and that several Roundnesses were made by those Rib-like Particles, till the middle Point of the Corral, in which there was no opening, became a long single Particle.

Now having observ'd, that the Corral, by being heat'd, did not burst in Pieces, but was only split or rent in one place, I imagin'd, that the Matter which was driven out of the Corral by the heat of the Fire, evaporated thro' that rent that was made in the Corral; or else that the Parts of the Corral being open'd by the Heat, the Moisture that was in the Internal Parts might be drawn up towards the External.

After this I took a little Piece of Corral, and put it into a Glas, and put that into the Fire, encreasing the Degrees of Heat so fast till the Glas was melted, but I preserv'd the Matter that was drawn off as well as I could, and viewing it thro' a Microscope, I discover'd

a waterish Moisture, which to the Eye appear'd yellowish, and which was mingled with a great number of small Particles, which were thick and troubled, and 'twas also mingled with a lowish Oyl, which, where it lay the least, was of a yellowish Colour.

I took, moreover, some other Pieces of Coral, and laid them upon glowing Wood-coals, and put them to so great a heat, that the Colour turn'd from black to a fine Whiteness; and in that condition I threw upon them some clear Rain Water, and observed, that the Parts thereof were immediately separated, and the most part of it in appearance turn'd into a White and Chalky Substance; and the reason why all the rest of the Coral was not dissolved, was, in my Opinion, because a sufficient heat cou'd not reach the Parts of it; for when I took the Remainder, and heated it as I had done before, the same Effect was produced in that likewise.

The Water in which the Coral was quenched, had not stood a Minute, but that I cou'd perceive a Skin or Membrane of Salt Particles, with which it had been impregnated, upon the Surface of it, and which consisted of such an unpeakable Number of small Salts join'd to one another, that it was impossible to discover the Figure of them.

After the Water had stood some Hours, I discover'd an abundance of Salt Particles, and of so many several Figures, that it was impossible to describe them, some of them were as clear as Chrystal, and it was a very pleasing Spectacle to see so many several Figures of such different Shapes and Sizes, lying together in such a narrow compass; and as fine and shining as they were when surrounded with Water, no less Dark were they almost all of them when the Water was evaporated, and then it appear'd as if they were dissolved into a great many small Particles, seeming to be of a Whitish Substance;

at another time, I fancy'd that I saw the Watery part, which lay upon or about those Salt Particles, impregnated with abundance of others much more small than the crass, which in the evaporating of the Water, were coagulated upon the first mention'd clear Salts, and so produc'd the shining, or glaziness of those Salts.

After some Days, having decanted the Water off the Whitish Matter, and poured fresh upon it, I observed, that there were Salt Particles still coagulating upon the Superficies of the Water; and those Salt Particles were extracted from the Corral in so unspeakable a Number, that no Body wou'd believe it unless he had the Experience of it.

From hence we may conclude, that the hardness of the Corral proceeds from no other Cause but the great number of its fix'd Salts.

Now forasmuch as the Heat of the Fire was sufficient to take away the Redness of the Corral as soon as it was put into it, I laid three little Pieces of Corral on *Aqua fortis*, to try whether that wou'd have the same Effect; and I had no sooner poured the *Aqua fortis* upon the Corral, but the Air Bubbles, which came out of the said Corral, took up four times the space the *Aqua fortis* had filled before; and the Corral, moreover, by Reason of the great Multitude of Air Bubbles, that continually came out of it (some of which also stuck upon it) was rais'd from the Bottom to the Superficies of the Water, but the said Water was not in the least tinged with the Red Corral, but it became Whitish which was occasion'd by all those Parts separated from the Corral; and when the *Aqua fortis* had no more power to dissolve the Corral, by reason that I had poured but a very little upon it, the aforementioned dissolved Parts subsided to the Bottom, and the Superficies of the *Aqua fortis* resumed its first clearness.

After

After the *Aqua fortis* had stood about two Hours upon the Red Corral, I took a little of that Whitish Matter that had sunk to the Bottom of the Glass, and putting it upon a clean Glass Plate, I discover'd an unspeakable Number of long Particles, that seem'd just like a very fine Hair of one's Beard after it had been shav'd off two or three Days.

I took also some of the upper part of the *Aqua fortis* that was clear, and pouring it upon a clean Glass, I likewise discover'd therein a great many long Particles, such as are mention'd before; and when I examined more closely into that White Matter that had subsided to the Bottom of the Glass, I found that 'twas nothing else than the slender Particles abovementioned, some of which were longer than the rest.

The *Aqua fortis* having not been sufficient to dissolve all the Corral, I added a little more to it, and then observed, that in a short time the remaining part of the Corral was not dissolved, saving that a very few Particles which were composed of much smaller, (or rather those smaller were again coagulated) floated upon the top of the Water, but 'twas impossible to discover of what Figure they were; and then the *Aqua fortis* which had been impregnated with the Red Corral was very clear, but when I came to view it thro' a Microscope, I discover'd, that there were still an unspeakable Number of the aforesaid long Particles floating therein.

I placed the said very small Particles before a Glass, which magnified much more than that I had already used, and then I discovered such exceeding slender Particles, as did almost escape my sight, and which, I suppose, were altogether invisible before.

With this Glass I discover'd long Particles, which did not only exceed the rest in length, but in thickness too, and the Ends of which were blunt; and having discover'd in some few of them three distinct sides, I con-

judg^t that they were of an Hexangular Figure, and for this reason, but they were Salt-peter Particles.

From these Observations, I consider'd with my self, that these Salt Particles, in which, I said before, I observ'd so many different Figures, were not of the same Shape with those very slender Particles that I discover'd when I dissolv'd the Corral in the *assafoetida*, notwithstanding they were a thousand times smaller than they appeared thro' the Microscope; and the difference of their Figures may perhaps be occasion'd by the Accesion or Coagulation of these Particles, which in one place may be greater or less than in another; and accordingly the Figure and Size of them are determined by their nearness or distance from one another.

After this I broke off two little Pieces of Red Corral from a small Shell I had lying by me, and which is described in a preceding Letter, by *Fig. 4. Letter A*; and placed that likewise upon a piece of Wood-coal, which I made red hot by blowing on it the Flame of a Wax-Candle; and in that condition threw it into a little clean Rain-water, and presently observed the Corral to be dissolv'd into a fine White Matter, and soon after the Matter overspread with a Scum, which from time to time increased in thickness; and about two hours after, amongst the infinite Number of exceeding small Salt Particles, I saw some of a larger size coagulated, agreeing with the atorementioned Salt Particles; in short, one would imagine, that the Salt Particles that were separated from that little piece of Corral, and which were coagulated in and upon the Water, did altogether make a greater Body than ever all the Parts of the Corral it self would amount to.

Now having been informed, that a certain Physician or Surgeon (esteemed by some Persons, but of small Reputation with others who have Skill in Physick) did make use

use of Corral in his Medicines ; and being my self of Opinion, that Corral can be of no manner of Service to the Bodies of Men, I took some of the finest Red Corral that one shall see, and put it into Post Paper, and beat it with a Hammer upon an Anvil to Powder ; after that I put the same Powder into a clean Glafs, and poured upon it fair Rain-water, till the Particles of the Corral were cover'd with Water ; then I heated the said Water so much, that I caus'd it to boil about a Minute, and put a little of this Water, after it had stood some time and was grown cold, upon four several places, and upon the cleanest Glasses I cou'd get, to the end that the Water might for the most part, or rather altogether evaporate, and that I might by this means discover, whether any of the Salt Particles were gone over to the Water ; for in case none of the Salt Particles shou'd go over to the Water, how can any one suppose that Corral has any influence upon our Bodies, in respect to our Health.

After that this Water was intirely evaporated I view'd it carefully, but cou'd discover nothing remarkable in it ; and when I had also caus'd the clean Rain-water to evaporate, I cou'd not but think that there was no other difference between that and the other Water in which the powder'd Corral was boiled, than that there were more Particles in the Rain-water, than in that which was boiled.

I also view'd the Water, in the bottom of which the boiled Corral lay, several times with my naked Eye, so long till the Water was in a manner evaporated, but I cou'd not in the least discover any Salt Particles in it ; and the Water, moreover, remained very clear : In short, I conclude, that 'tis impossible that those fix'd Salts, of which Corral is for the most part compos'd, can possibly be dissolv'd in the Body, but only by sharp Salts or by Fire, and consequently, that it is also-
gether

gether an unprofitable thing in Physick ; and who know whether they that cry up Corral so much, did ever make any use of it, unless it were to amuse common People with uncommon Medicines, and thereby get themselves a Name, whilst they are in the mean time only cheating the World ; of which we have so many Examples.

I have likewise examined into two other sorts of White Corral, and noted some few Remarks upon them ; but I shall not trouble you with more at present, but conclude, and remain

Tours, &c.

II. Part of a Letter from Mr. Ralph Thoresby, F. R. S. to Dr. Hans Sloane, R. S. Secr. concerning some Roman Coins found in Yorkshire.

ON Saturday last Mr. *Arthington* obliged me with the perusal of some *Roman Coins*, which a few days ago were Plowed up at *Cockridge*, in some Grounds he purchased of Mr. *Kirk* Junior, and are a confirmation of the Conjecture of his Ingenious Father (the late *Thomas Kirk Esq;*) that the *Roman Via Vicinalis* (which comes from the great Military Road upon *Bramham-Moor*) passed from that Station at *Adellocum* (of which there is an Account No. 282. of the *Philosoph. Transact.*) thro' these Grounds to *Ilkley*.

There are but few of them, (not above Twenty that the Servants confess to) but those mostly very fair : The eldest he has is of *Domitian, An. Urb. Cond. 846.* which you know falls in with the Year of our Lord 95³; his
Head

Head is surrounded with this Inscription, IMPERATOR CAESAR DOMITIANUS AUGUSTUS GERMANICUS P. M. (Pontifex Maximus) T. R. P. (Tribunitia Potestate) XIII. The Reverse shews he was then saluted Emperor the 22d time, IMP. XXII. COS (Consul.) AVI CENS. PP. (Pater Patriæ,) the *Flavian* Family particularly affected the Title of *Censors*, and *Domitian* is the last Emperor who has that Title upon his Medals; the Figure upon this Reverse has a Helmet upon the Head, and a Spear in the Right Hand.

The next is of *Nerva's*,

IMP. NERVA. CAES. AUG. PM. TRP. COS. Reverse CONCORDIA EXERCITIVM. Dextra juncta.

The next Seven are of *Trajan's*, but all different,

IMP. CAES. NERVA. TRAIANVS. GERM. Rev. PM. TRP. COS. III. PP. figura stolata stans, sinistra cornucopiæ.

The next has the same Inscription, save that it was in his 4th Consulship, and has *figura galeata cum hasta*.

IMP. TRAIANO. AUG. GER. DAC. PM. TRP. Rev. COS. V. PP. SPQR. (Senatus Populusque Romanus) OPTIMO PRINCIPi. Pacis stantis typus, dextra facem admoventis spotis, ea conflagraturus, sinistra cornucopiæ tenentis. (exurge) PAX.

IMP. CAES. NER. TRAIANO. OPTIMO. AVG. GER. DACICO. Rev. PM. TRP. COS. VI. PP. SPQR. Deus Genius stans, dextra pateram.

IMP. TRAIANVS. AVG. GER. DAC. PM. TRP. Rev. COS. VI. SPQR. OPTIMO. PRINC. fig. stolata.

IMP.

IMP. TRAIANO. OPTIMO. AVG. GER. DAC.
P.M. TR. P. P. Rev. COS. VI. PP. SPQR. figura de-
lta dextra Caduceum, sinistra cornucopiæ.

IMP. TRAIANO. AVG. GER. DAC. PM. TRP
COS. VI. PP. Rev. SPQR. OPTIMO. PRINCIPI. Co-
lunna cochlidis *Trajan*.

The rest that are legible, are of *Hadrian's*, viz.

HADRIANVS. AVGVSTVS. Rev. COS. III. Vi-
ctoria cum Palma.

The other has upon the Reverse,

FELICITATI. AVGVSTI. Above the *Navis Pre-*
stia, and below it COS. III. PP.

These are all of Silver : There was a large one of Copper
of the Emperor *Domitian*,

IMP. CAES. DOMIT. AVG. GERM.
but the Reverse was not legible.

John Dyneley of *Bramhope* Esq; has also three, one with
FIDES EXERCITVVM, one of *Titus's*, and one of
Trajan's with *Dacia* Captive under a Trophæ, but I want
the Inscriptions ; all the rest are in the Possession of the
Ingenious *Cyril Arthington* of *Arthington* Esq; the Lord
of the Mannor, who obliged me with one, for Lectu-
ring upon the rest, the Figure whereof I send you, it
being upon a remarkable Occasion, and not mentioned
in *Osco* (at least in my Edition of that Author;) 'tis in-
scribed HADRIANVS AVG. COS. III. PP. Rev.
RESTITVTORI HISPANIÆ. This was upon his
peaceable settling of Affairs in that his Native Country ;
Spain is represented here as a Woman with a Branch in her
right

right Hand to denote her Fruitfulness, kneeling before the Emperor, who kindly takes her by the Hand to raise her up.



By these it appears, that this Station flourished when the *Röman* Empire was in its prime; and there being none of a later Date, makes it probable, that it perished in some of the Insurrections of the Native *Brigantes*, about *Severus's* Time, as it was conjectured from the form of the Letter A in the Inscriptions upon the Funereal Monuments formerly accounted for. (*Philosoph. Transact.*, No. 282.)

Leeds, April 19, 1708.

III. Part of a Letter from Orlando Bridgman Esq;
F. R. S. to Capt. Wine, giving an Account of a
Storm of Thunder and Lightning that happen'd
at Ipswich, July 16, 1708.

Ipswich, July 20, 1708.

THERE happen'd here on the 16th past, a most Violent Storm of Thunder and Lightning, the Effects of which have been both wonderful and dismal; it began about Six to be perceived at some distance, and arose in the South West: I happened then to be on the highest Eminence about this Town, from whence I could very plainly distinguish the working of the Storm, and can't but take notice to you of one thing I thought very

U

re-

remarkable, and what I had never met with before ; I judged it then to be about four Miles distance from me : The Instant I perceiv'd the Flash, it seem'd to extend itself like a Bow, and cast its Light a considerable way round it, and the Shaft of Lightning (if I may so call it) did not run in a waving Angular Figure as usual, but in a strait Shaft of Fire, like the Fuze of a Bomb, directly from the Cloud to the Ground ; upon which, and finding the Storm approach, I hastned home, which was not a Mile. Soon after, we had two or three of the greatest Flashes of Lightning, and the noise of Thunder that succeeded them was so very great, and caused so great an Emotion in the Air, that it made the Rooms shake, and the Windows rattle, as in a great Storm of Wind. Dr. Dade a Physician, and very Ingenious Gentleman, assured me, as he came from his House to me just at that time, the Lightning seem'd to dwell some considerable space on the Ground, and that he could very plainly feel the heat of it in his Face. The Passage-Boat was at that time, coming from *Harmich*, and just got to the Town or very near, when came a terrible Flash, which killed the Master and three Persons more that were on Board. I saw one the next day that underwent that dismal Fate, he had a Wound in his Thigh, his Breast was lacerated as if he had been whiped with Wires, and his Face and Body as black as if he had been blown up with Gunpowder, and thousands of small Black Spots about him. The Master of the Vessel was not at all disfigured, but had one Wound of his Side like a fresh Burn, and no other Mark about him; save the Chain of his Watch was melted, and no harm nor Burn could be perceived on his Breeches or Cloaths. The third Person, who was a Servant, was very much torn and shatter'd about the Head, the Crown of his Hat was taken clear out, as if it had been cut out, and several Parcels of his Hair drove into the Substance of the Hat. The fourth was very little

tle disfigured, only a Black Spot on his side, and a small Wound, as if made with a Cauterising Iron : there were several others aboard wounded and stunn'd. One *Artis*, among the former, had his Hair burnt close to his Head behind, and his Peruke untouch'd ; he had a Scratch on his Arm about 4 Inches long, and a small hurt below the Elbow ; he fell that Night into a Violent Fever, grew delirious, and if not dead yet, is pronounced irrecoverable ; whether he receiv'd any hurt on his Brain, or the Violence of the Fever causes the Delirium, remains undetermined ; there was no mark to be seen on his Coat, Waistcoat, or Shirt, where he had his hurt on his Arm. Two of the Persons kill'd were on the outside, and the other two under the Tilt of the Boat ; and what is pretty remarkable, the two that were within the Tilt, sat on each Hand of a Woman that received no damage : one Person had the Sole of his Shooe unripped from the Leather, and no other Damage. I wonder the Blast lighting so directly on the Boat, did not shatter it all to pieces : there was another Boat that followed them, and received no damage, and took out the rest of the poor frighted Wretches ; the Master of which does affirm, he saw the Fire light on the Bow-sprit of the former Boat, where meeting a small resistance, it flew into small Streams like a Rocket, part into the Boat, part into the Water ; which, if true, no doubt was the cause of the Mischief being done in so many different Parts of the Boat, whoever was unfortunate enough to be in the way of those fiery Darts, being the Sufferers ; and does in some measure solve the seeming difficulty of the Womens being unhurt between the two Persons that were kill'd ; and tho' there has been a great many very pretty Conjectures by Learned Men, to explain the Effects of Lightning, yet every remarkable new Accident of that kind, furnishes fresh Difficulties different from the former : If this proves any thing entertaining to you, it will be a great Satisfaction to me.

IV. *A Letter from Mr. Jos. Nelson, concerning the Effects of the abovementioned Storm of Thunder and Lightning at Colchester.*

Colchester, July 26, 1708.

S I R,
HAVING taken notice of the Strange Effects of Thunder you Published for the Months of *January* and *February* last, the like was strange in this Town of *Colchester*. On *July 16 die Veneris 1708*, about Eight of the Clock at Night (the greater part of the Afternoon being Cloudy, but more thick toward Night, with Thunder at a distance for above an Hour before, and much Lightning) I heard a Thunder-Crack so loud, as if it were close to me, (the like I never heard before;) at which time the Thunder and Lightning broke into Mr. *Josbua King's* House, at the Sign of the *Flag* in *Maudlin-street* in *Colchester*; beginning at the South side thereof at the Gable-end, breaking several Roof-Tiles, and near 20 other, as at *c* in the *Figure*, continuing its Course Perpendicular, and in a strait Line (the only Motion that seems consistent with such Violence, which it seems was otherwise in the Gentlewoman's House in *Ireland*) it went into a Leanto, and lighting on a bunching out of the Wall at *a*, it entered into the Strong-Beer Buttery thro' the Laths, and forced a Cork out of the lower Tap-hole of a Butt, to the Loss of some Gallons of Beer; in its way at *a*, it shiver'd a Stud about three Inches Square, so that one side remain'd nail'd to Laths, yet not much thicker than a Lath, and also brake

it in two as if it were a Tobacco-Pipe. Below the Beam at *b*, it clave or split a Stud, about 4 Inches square, several Foot down, which is there standing; this was from its violent razing on the outside. At the time of this Bo- the said Mr. *King* was in the Lean-too, and thought he should have been destroyed with the Lightning, but received no hurt; he smelt a strong Sulphurous Scent. I cast the broken Wall divers Rood with the Violence. There was some little damage done to *Abballen's* Church about the same time in the said Town.

But that which was most lamentable, divers Boats were carrying Persons from *Harnich* to *Ipswich* on the *Orwell*; the violence of the Thunder and Lightning killed four dead immediately, made a Lad run Mad, and wounded the rest that were in that Boat, which were twelve Persons, and melted a Watch and the Chain all of a Lump which was in a Dead Man's Pocket; this was about the same time of the aforementioned. Mr. *Thomas Holbourn* of *Colchester*, Goldsmith, was Eye-Witness to this: being in one of the Boats, he smelt such a Scent of Sulphur as he could not bear. This was about eighteen Miles N. E. of *Colchester*, and one Mile S. E. it was no more violent than an ordinary Storm.

V. *Part of a Letter from Dr. Arthur Bury, to the Reverend John Chamberlayne Esq; F.R.S. concerning the Manuring of Land in Devonshire by Sea-Sand.*

Compton, March 8, 1708.

S I R,

I Have your obliging Letter of *February 28.* accompanied with the Archbishop of *Dublin's* to the *Royal Society*, &c. The Burning of the Surface is so much practised in *Devonshire*, that 'tis elsewhere known by the Name of *Devonshiring*; but it is used only for bad Lands, and by worse Husbards; for it robs the Ground, as the Good Prelate remarks.

Salt quickens dead Land, and is used in the South West part of that Country, which would else be the barrenest, but is now the richest part of it. They go as far as the Sea will permit them at lowest Ebb, and take the Sand in Bags, and carry it on Horse-back 14 Miles into the Country, and spread it upon the Land, and thereby improve it both for Corn and Grass. In other Parts they force their Barren Land, by mingling the Earth with Lime, and casting it upon the Ground.

In this they differ, that Crude and single Salt, if strew'd upon the Ground, does not improve, but corrode it; but Lime, tho' unmingled, betters it: but in this they agree, that they produce not Grass fit for their Scythe, but for Pasture, short and sweet, and growing all the Winter; so that their Sheep know not either Hay or Water, nor are their highest Grounds parched by the Sun in the hottest Summer. This is Matter of Fact known

known to every Plowman ; what I further add, I wish were so to every Gentleman, that by the Marriage of the Male and Female Salts, they might enrich both their Country and themselves. The Sea-Salt is too lusty and active of it self, the Lime has a more Balsamick, but gentler Salt ; and regularly joined with the other, is thereby invigorated. How to match these two, Glauber thus directs. *Take (says he) Quick-Lime, let it slack by time without Water ; then take Salt and Water, mingle them together, and make them into Balls or Pieces, which you please ; dry 'em as you do Bricks, then burn them for about two Hours This Compost will enrich your poorest Land.*

Were I so devoted to Agriculture, as you suppose, I should remove my Dwelling to such a Situation, as were best accommodated with these three, Lime, Salt, and Coals ; and did our Gentry understand this Husbandry, they would so far free Salt from its Tax, as it should be employed upon Land, which is not intended to pay for it.

VI. *A Letter from Mr. Edward Lhuyd, Keeper of the Ashmolean Museum in Oxford, to Dr. R.R. in Yorkshire ; giving an Account of a Book, Entitled, OYPEΣI•OITHΣ Helveticus, five Itinera Alpina Tria, &c. Authore Joh. Ja. Scheuchzero, M. D. Lond. 4to. MDCCVIII.*

Honoured Sir,

HAVING had the Favour of a Perusal of Dr. Scheuchzer's *Itinera Alpina*, as the Sheets were printed off, I take an Opportunity offer'd by a Friend, of sending you some Account of Part of that very Learned and Ingenious

several other Places on the Mountains of *Wales* and *Scotland*. But 'tis to be observ'd, that as it is not one Spring that makes any considerable Brook, much less a large River; so no Rivulet carries the Name of the River it flows into, to the Fountain Head; the Names the Rivers are distinguish'd by, being given to the Confluence of divers Rivulets in the Lower Valleys; where if they form a Lake, as they very often do, that Lake is most commonly, not to say always, denominated from the River; and not, as some contend, the Rivers from their Lakes. The reason of which is, that the Inhabitants on the Rivers, found it necessary to give them Names, more early than to the Mountain Lakes, which at the first Peopling of a Country, were known comparatively but to very few.

It. 2. p. 45.

But the most Remarkable Place our Author mentions for Springs, is the Town of *Films*, which he says is thence denominated; the Word *Film* signifying a River in the *Grisin* Language. About half a Mile out of Town, there are most clear Springs, which break forth at the Foot of the Mountain, which immediately constitute Rapid Streams, and in the Village it self are reckon'd thirteen; where the Waters gush forth with a sort of noise, in Rivulets from half a Foot to two Foot broad. Some of these are Temporary, which the Inhabitants ascribe to the melted Ice and Snow; others Perennial, supplied from the Great *Hydrophylasia* in the Bowels of the Mountain. The most considerable of these Fountains is call'd the *Gorg*, quasi *Gurges*; which is a Perennial one, and of it self serves to turn a Mill. Another place is call'd *Furnash*, where four Rivulets spring within the Distance of eleven Feet. *Ily Davos* is also a Temporary Spring, but nothing so cold as the rest. *Whoever would be Curious* (says he) *to trace out the first Sources of these Fountains, in the very Bowels of the Earth, may receive some Light if he considers that the Town is situated at the Foot of the OBER ALP, which Mountain is not [as generally they are in the Alps] rais'd to a sharp Ridge; but compos'd of exceeding broad Rocks, such as have no Fissures, but are continued, after the manner of Alesbick.* He compares it, he says, to an Alembick; because he is fully perswaded, that this *Phanomenon* ought to be conceiv'd in the same manner, as Distillation is commonly and easily explain'd: viz. that there are Aqueous Vapours rais'd in great plenty from the deep Bowels of the Mountain, to the Top, by means of Subterraneous Heat; and that they are (*quoad minimam partem*) exhal'd into Air; which meeting with the Rocks shut on all

all sides, is condensed into Water; and that trickling down, stagnates in those great Cavities we call *Hydrophylacia*, whence afterwards by Subterraneous Natural Aqueducts, the Waters are convey'd to this Village, and those Neighbouring Places where we see them break forth. The Inhabitants are said to have made an Experiment to find out the Subterraneous Passage of the *Gorg*; which was, the casting down some Saw-Dust at a Cleft of the Mountain, towards the Top, where they heard the noise of running Water; and those who were left to watch below, found the Dust come out at the Spring. They pretend to distinguish some of those Waters from others as to Goodness, tho' our Author, upon Tryal, found them all of the same weight. The People that live here, tho' in all other Respects very lively and healthy, become sooner Gray and Bald pated than elsewhere; and this they all attribute to their drinking these Waters.

I must not here omit the giving you some Account of the *Alpine* Torrents, which do sometimes Incredible Damage in these Countries. These they call *BACHEN*, a Word agreeing with your Northern *BECK*; as their *BRUNNEN* [Springs] does with *BOURN*.

The First he takes notice of, is the *SPREITENBACH* at the *h. 1. p. 4.*
LESSER AUBRIG; which often lays the Farms waste by its sudden Inundations. *The River Nolla*, says he, *which springs at the f. 2. p. 27.*
Foot of Beuerin Mountain was so called by the Ancients, *quasi Nolla*, but in our Days it enlarges daily its Bounds; and is so Rapid and Destructive, that it often ruins whole Fields, Houses, and Stables. It's easily distinguished in the *Rhine* from that River, by its Black Colour; which he attributes partly to the Swiftneſs of both Streams, but chiefly to the weight of the *Nolla*, by which it forces it self thro' the lighter Water of the *Rhine*. The Black Mud of the *Nolla*, which contains plenty of very small Cubical Pyrites, is the occasion of its Colour. At *Flims* he saw the Destruction wrought, by a small Brook (a little before his coming) call'd, *Der BLAUNE*, which flow'd with so much Violence from the abovementioned *OBERALP* Mountain, that breaking its Bank, and taking a new course, it almost ruin'd half the Town. The Houses were batter'd thro' by an Infinite number of Stones; Stables and Barns broken, and Rooms of dwelling Houses fill'd up with Mud, Earth and Gravel. Such a Flood they call *RUFIN*, where of one had happen'd at this Place before, in the Year 1687, and

N. 2. p. 51.

another in 1572, when several Houses, and part of the Church, were batter'd down. But the most surprizing of all he mentions, is that at *NIDER URN*, which had almost destroy'd the whole Town. Of this, the Minister of the Place sent him the following Relation. " This Disaster happen'd (says he) on the 2d of *August*; which was a clear, calm Day. Towards the Evening the " Sky seem'd to threaten Rain, but not so much to us as others; " upon which I began to be concern'd for those of *MOLLIS*, " and others of the higher Villages. There seem'd to be there " and elsewhere a great Rain; tho' so tolerably clear with us, " that we were rather in hopes 'twould soon be over, than apprehensive of Danger. But 'twas not long after, that our Sky " was also cover'd with Black Clouds; and between the Hours of " Six and Seven the Rain began to fall, not in Drops, but as if " pour'd out of Pitchers; whence fearing, as well as others, " some Mischiefe from our Brook, I began to run to a neighbouring Bridge; to assist at the removing it, but too late as well as " others; for as soon as I got out of the House, I met the People " in a great Consternation in the Grove adjoining, taking their " Flight and forsaking their Houses and Streets for fear of the swelling River; making the best of their way to my House for their " Security, and advising me either to flee quickly, or return. " Whilst I was in this Surprize, and returning home, the Flood " begins to dash the Walls of the House, tho' remote enough " from the Channel of the River; and to beat so hard at our Heels, " that I could scarce shut the Door. Looking out at a Window, " nothing appear'd in View, but a *Sky and Sea*, a Lake I mean, " brought suddenly over the whole Town, breaking down " Mounds, carrying away Timber and whatever else it met with; " breaking in many places the Doors of Houses and Cellars; " driving before it all Bridges, and in some place throwing down " Walls. Destroying several Fruit Trees by rooting them up, " and spoiling much more. The Seats were found swimming in " the Church; the Buildings near the first Effort of the Flood; a " Tucking and Grinding Mill (but such as were not inhabited) so " entirely destroy'd, that there was not the least Track of them " remaining. Some Men carry'd the Feeble Women on their " Shoulders to the higher Places; and many by avoiding one " Danger, fell into a worse; whilst leaving their Houses to flee " elsewhere, they were oblig'd to climb Trees. The cause of so " great and surprizing a Deluge, seems to have been a vast Storm " in

“ in the higher Grounds mixt with Hail, which fell in such a Quantity on the Mountains of *Niederthun*, that there were Heaps of them as high as Houses; wherein whole Fir-trees, which the Waters had eradicated, swam upright; whence so immense a Quantity of Water collected in the *Aps*, after having ruin’d the Mountain Pastures, was born down with such Violence, rooting up Firs and other vast Trees, and rowling before it Gravel and Stones. By this means the Channel of the Brook, at the Foot of the Mountain, may be suppos’d to have been stop’d for some time; whence breaking forth afterwards with the greater force, and at unusual and deep Places, the fatal consequence here describ’d naturally ensu’d:

The *Pelictian* and *Grisson Alps* afford, it seems, no small number of Periodical Rivulets, such as our *Lombard* in *Baskire* describ’d by the Poet *Juv. Ven.* and *Mr. Hippoly.*. These they call *MEYBRUNNETZ* or *May Springs*; one of which he met with in his First Journey. From its White Colour, call’d *DER MILCH BACH*; which flows out of a Mountain Lake, call’d, *ALPELER SEELIN*, only in the Months of *June* and *July*. Another he mentions at *GRAFFENORTH*, betwixt the Abbey of *ENCELBURG*, and the Town of *WOLFFENSCHIES*, call’d from the extraordinary Coldness of the Water, *IL KALTE BRUNN*. This breaks out about the third *May*, and descends towards the middle of *June*. It was look’d upon as ominous, that in the Year 1700, it should continue to the Month of *October*. Another of the same sort, not far off, is call’d, *DER DORBRUNNEN*. In the Valley of *VITTIETHAL* he takes notice of two Brooks, call’d, *GORBSBACH*, one whereof is about two, and the other three Foot over, at their first appearance out of the Rocks; whence he concludes, there must be some vast *Hydrophylacium*, or Natural Cistern in the Bowels of the Mountain. These, tho’ they are not to call’d, observe the same Course with the *MEYBRUNNEN*; and in the 2d Table he has given us a Draught of the Mountain, and the issuing forth of these Springs. But the most celebrated, and particularly remarkable, is that of the Valley of *HASHTHAL* in *BERN*. This Fountain observes a double Course or Period; one Annual, and the other Diurnal or Horary. It flows only three Months, viz. from the midst of *May* to the midst of *August*;

* *Plot's Nat. Hist. of Staffordshire*, P. 57. Paragraph. 46.

but not (as the rest of the *MEYBRUNNEN*) continually : For generally it flows only about Eight in the Morning and Four in the Afternoon. But its Course, for what has been hitherto observ'd, is very Irregular. Sometimes the Water breaks forth in an Evening, and continuing all Night, ceases in the Morning ; at other times it resumes its Course in the Morning, and often recovers it at other times of the Day ; very often it runs three or four Days together ; and at other times for several Days no Water at all appears. He affirms the Water of their *Alps* in general to be exceeding light, insomuch, that tho' they are drunk plentifully, they do not in the least clog the Stomach, which is usually offend-
 ed by other Waters ; and this he Parallels with an Observation of
 Sir *Robbert Sibbald's* of the Water of *Holia* in *Orkney*. Several of
 their Spring Waters when boil'd, turn of a whitish Colour, and
 precipitate a white Powder ; as particularly that of the *MEZG-
 BRUNNET* at *LACHEN*, which is therefore thought impreg-
 nated with Alum.

Having done with his Observations on the Rivers and Brooks, and Common Springs ; what remains, are those he has on the Mi-
 neral and Medicinal Waters. On the highest Plain of *Hackn*,
 he met with a cold Sulphureous Spring, encompassed with a Wall,
 and cover'd with Tiles for the use of Travellers ; who take large
 Draughts of the Water, without the least Inconveniency ; tho' it
 has a black clayey Earth, of a strong Sulphureous Scent.

Not far from the Springs of the River *Oen*, are the Waters of
 St *Maurice*, so much frequented by the *Grisons*, *Switzers*, *Germans*
 and *Italians*. He declines here (which is also his Laudable Me-
 thod throughout the whole Book) the Transcribing what has been
 written by other Authors concerning these Waters ; contenting
 himself with the Character *Paracelsus* gives them ; and adding
 some few Observations of his own. *Before all the Acidulæ I know in
 Europe (says Paracelsus. *) I must celebrate those I met with at
 St. Maurice's in Engedin, which runs most Acid in the Month of
 August. Whoever drinks that Water as Medicinal, acquires Health ;
 and never becomes Subject to the Stone, Gravel nor Gout : For it so
 strengthens the Stomach, that it enables it to dissolve Tartar and di-
 vers other Bodies, which taken in our Meat and Drink, occasion Di-
 stempers.* This Spring gushes out bubbling at the Foot of the Moun-

* *Theophr. Paracels. de Morbis Tartareis*, c. 16. p.m. 323.

tain in a corner of a Fenny Meadow, about a quarter of a Mile out of the Village. The Well is half a yard over; and has a Building like a small Chappel for preserving it, and to keep it from a mixture with Rain. The Water has a strong Vitriolick Taste, and upon Tryal, he found it to be the heaviest of all he examin'd that whole Journey, viz 3li. 3vi. gr. 37 So that a Pound of it contains 3i gr. xxvi. of Vitriolico-Saline and Chalybeat Particles. That they contain such Bodies appears not only from the Taste, but also from these following Experiments. Spirit of *Sal Armoniac* with Spirit of Wine a little alter'd it, and the same Spirit with Urine turn'd it of a whitish Colour. Also Oyl of Tartar *per deliquium* made it Milk white; and Powder of Gauls turn'd it first carneous, and then of a Blackish Red. So that these Waters must proceed from Vitriolico Chalybeat Veins, wherewith the adjoining Mountains and Valleys abound. There are here and there, other Chalybeat Springs in the same Mountains, which leave a yellow Sediment, and have an Acid Taste, as particularly that on the North side of the Valley over against this St. Maurice's Well. The Waters of *Andera*, call'd *Das Bad*, *It. 2. p. 29.* [or] the Bath] is an Insipid Chalybeat, containing in a Pound weight 51 Grains of Heterogeneous Particles. It turns a little whitish with Spirit of *Sal Armoniac* prepar'd with *Alye*; somewhat muddy with Spirit of *Sal Armoniac cum S.V.* Milk-white on Affusion of Oyl of Tartar, with a Sediment of the same Colour, and reddish with Powder of Galls. Not far from the said *Andera* is a very clear Water, which if drunk plentifully creates an Appetite. It's of the same weight with the above mention'd Chalybeat, and strongly impregnated with Iron Particles, to which he ascribes its Quality.

But his largest and most particular Account is that of the *Pepers Bath* [or *PFEFFERS WASSER*] which if it does not exceed all the Baths of *Europe*, may vie with the most celebrated of them. There has been an Account given of it in particular Tracts, by *Paracelsus*, Mr. *Kolweck* Secretary to the Abbey of *Pfeffers*, Dr. *Zimmerman*, *Augustinus Stöcklin*, *Abiss*, and *Schmuzius*; and occasionally by divers other Authors. They were discovered by a Falconer accidentally, in the Year 1240. The Water breaks forth in a dreadful Place, scarce accessible to the Sunbeams, or indeed to Men unless of the greatest Boldness, and such as are not in the least subject to Dizziness; so terrible is the narrowness of the way, and of the Bridge which is supported al-

most

molt every where on Rocks, and so affrighting the swift Course and Noise of the *Tummina* dash'd against the Rocky Precipices underneath. The Aqueduct and Bridge are in length about 600 Paces. It is not one single Stream that breaks forth, but several, the chief whereof which is lock'd up, is so large that it suffices to turn a Mill. The side Springs, tho' the Water be of the same clearness and goodness, are not preserv'd for any use; but having got out thro' the Fissures of the Rocks and clayey Earth, mix their Waters with the Rapid *Tummina*.

These Baths have that singularity of all others, that they commonly break forth in the Month of *May*, and that with a sort of Impetuoufness with Beech-leaves, Crabs, or other Wood Fruit, their Course desisting at *September* or *October*; so that they may be reckon'd among the *MEYBRUNNEN* describ'd above; tho' it must be own'd they flow more plentifully some Yearsthan others.

11, 2. p. 1, 2.
50.

In the Year 1704, the Author took a Journey to these Baths for the Recovery of his Health. His Distemper being certain Obstructions with no small pain in the Cutaneous and Glandulous part of the Head, especially at Full and New Moon, which he had been afflicted with for some Years; and which occasioned at last a violent Headach, which the Drinking of these Waters remov'd, tho' not the first Malady. Having on this occasion a great deal of leisure time at the Bath, he made it one main point of his Business to examine the Nature, Qualities and Effects of the Water; and after repeated Experiments, he professes himself of Opinion, for several Reasons moving himthereunto, that these Waters are not impregnated with any Minerals; or if they do contain any, that their Virtues in curing Distempers and preserving Health, do not proceed from them.

1. They are exceeding clear, destitute of Colour, Taste and Smell: For as for that seeming Sweetness, which some Drinkers think they perceive, 'tis nothing but what's common to all warm Water.

2. It is therefore accommodated to the Taste of all, because being perfectly insipid, it affects the Organs of all Men alike; that is, their Palates are not made sensible by any Figures of Sulphur, Salts, or other Minerals.

3. By Infusion of Various Liquors or Powders; of *Aqua fortis*, Tincture of Tormesol, Juice of Berberries, Syrup of Violets, Distillation of Vinegar, Spirit C. C Spirit of Vitriol, &c. no change at all ensued; altho' each Infusion stood for the space of two Days.

Upon

Upon pouring on a Solution of Mercury Sublimate, he perceived at first no change; but soon after there appear'd on the Surface a small Film of the Beautiful Colour of a Peacock's Feather. Also Oyl of Tartar *per deliquium* caus'd no sudden Alteration, save only that some Hours after a small circular white Cloud subsided, the Liquor remaining diaphanous. In like manner *Tartarum tartarizatum Ludovici* produced a certain Whiteness. As for the Red Colour it receiv'd from the Tincture of Red Rosks it soon disappear'd, the Water recovering its clearness. These are but small Changes, and common enough in other Spring Waters, as well cold as hot.

4. By several repeated Experiments, he found it to be of the same Specifick Gravity with Rain Water, whence he supposes it destitute of heavier Bodies of what sort soever; or at least not so far impregnated with such, as the Effects might be attributed thereunto. He found this Water when warm, lighter than the cold by a Grain, in the Quantity of seven Drams, which he attributes to the rarify'd Air in the Pores.

5. No *Flowers* are here sublimated, no *Cremor* swimming on the Surface, no *Tophus* adhering to the Walls or found in the Aqueduct, nor any *Crocus* precipitated. He infers hence, that this *PEPPER BATH* is more pure and refin'd than any other Waters, whether Fountain or Mineral. If together with this, their moderate Heat be consider'd, and the extraordinary refinedness of the Particles composing the Water, these Obvious *Phænomena* of their Healing and Preservatory Faculty may be, he presumes, without much difficulty explain'd; which Explanation, tho' new and curious, because somewhat long, I leave to your perusal in his own Words. As for the Use and Vertues of these Waters, he says, 'twould require a particular Tract; and therefore he only Transcribes the following brief Account of them out of *Wagnerus*.

These most celebrated and wholesome Waters (says he) *are an inexhaustible Treasure of Health, because by drinking them as well as bathing in them, they remove the Obstructions of the Brain and Nerves, afford great benefit to such as are troubled with the Falling Sickness, Apoplexy, Headach, Decay of Memory, Hearing or Sight; the Palsie, Cramp, Convulsion, Stiffness of the Limbs, Obstructions of the Liver, Spleen or Mesentery, or Hypochondriac Melancholy. They yield Relief to the Gouty, and to those who are afflicted with Tedium Agues, or with bruised or broken Limbs and Malignant Ulcers; with the Stone in the Reins or Kidney. They dry up Tettens, Cancers, Fi-*

falls, &c. &c. &c. inmoderate Flux of the Menstrua, &c. But let those who are afflicted with the Dropsie, Consumption, Melaick Fever, Yellow Jaundice, Gout, Leprosy or Bloody Flux, as also with bleeding Wounds, avoid the use of them.

Of the same weight with this of the *Pepper Bath*, which, as is said above, is equal to that of Rain Water, he often found the Waters of other *Alpine Springs*, which he therefore esteems the more refinedly distilled; and as such, they are not only drank, but even quaff'd off in large Quantities, by Strangers as well as Natives.

12. 1. 7. 9. II. Several of his Observations about METEORS, are no less remarkable than those on the Waters. The South side of the *SCHNEN ALPS*, he tells us, are perpetually cover'd with Snow, and those Rocks of Perennial Ice of a pale blew Colour, call'd *FIRN*, which, as it seems from other Writers, as well as our Author, are no great Rarity in the *Alps*, tho' I could hear of no such thing in *Scotland*, and am sure there's nothing like it at *Snowdon*, and our other High Mountains of *Wales*. For this reason, the Natives call the Southern side of these *Alps*, *DIE WINTERLICH SEITE* [or *Winter side*;] and the Northern, *DIE SOMMERLICH SEITE*. Even the Valley of *ENGELBERG*, because guarded on all sides with such High Mountains, has always such a cold Air, that it has given occasion to the Proverb:

The pleasant Weather of Engelberg; Winter thirteen Months, and all the rest of the year Summer:

Which agrees with that of the *Grisons* in *RHINWALD*, who say,

The Year with them has three Months of exceeding cold Weather, and nine Winter.

1. 2. p. 4. He is of Opinion that cold Weather gains Ground. In this *Decay'd Edge of the World*, says he, *most of the Seasons of the Year grow colder; the Winter longer, the Summer shorter, the Wine pale and harsh*. The *Alpine* People take notice, and he adds, that he can also confirm their Observation; that the Quantity of Snow on their Mountains increases annually; inasmuch that, in Places where in Man's Memory, the Snow that fell in Winter would all dissolve the Summer following, to the great support of Cattle and Com.

Comfort of their Owners; 'tis now piled in great Heaps, such as never melts at all, but on the contrary are annually increased.

Whilst they ascended the High Mountain, call'd *SETZLBERG*, which is part of the *Julian Alps*, on the 21st of *August*; they were fatigued with the severe Rain and Sleet that fell, attended with a cold Northernly Wind. This Rain lasted all Night in the Valley, tho' the adjoining Mountains were almost half covered with Snow; and to Snow on Mountains whilst it rains in their Valleys, is but what often happens in our Mountains of *Wales*, and doubtless in the North as well in *England* as *Scotland*.

At *Selva piana* he takes notice of their Fountains being covered with a very thick Ice on the 24th of *August*. It. 2. p. 4.

On the *WALLENSTATTER SEE*, or *Lacus Ruvarius*, in It. 2. p. 12 calm and fair Weather they have Periodical Winds; which the Watermen make good use of, as they sail from *Wesen* to *Wahlenstad*, as also in their return. Early in the Morning before Sun-rising, an East Wind begins, and blows in the calm Summer Weather (whence its common Name of *Hay-weather Wind*) till about Ten. From Ten to Twelve the Wind ceases, and the Air is calm. After Twelve a West Wind begins, and continues till the Evening; and after Sun-set the Eastern (which is then call'd *DER OBERWIND*) resumes its Turn. The Northern Wind, no very welcome Guest to the Sailers, sometimes interrupts these Regular Gales. A Reflection on the situation of this Lake, will give us a clear Account of the *Phænomenon*. The Lake of *WALLENSTATT* is extended, from East to West, in a free open Air; and that Air soon admits of the Rays of the Eastern Sun; as 'tis influenc'd also by the Western till the late Evening. But on the North and South sides of the Lake, there are exceeding High Mountains, which occasion that the Waves being dash'd against the Rocks, are forced back; whence that boisterous Roughness, which so often threatens the Sailers. Hence 'tis easy to conclude, that the Atmosphere being rarify'd, or at least in some degree expanded by the Rising Sun, cannot diffuse it self to all Quarters alike; and so not being able to make an equal Distribution of its Air, nor altogether to get rid of it, being imprison'd betwixt the High Ridges of *GLARIS*, *ZUG*, and *SARGANS*, 'tis forced to take its Course Westward. And whereas it desists at Ten in the Morning, 'tis because the Sun begins then to culminate the Meridian of the Lake, and to affect the whole Atmosphere impending thereon: But from

Twelve to Five or Six in the Evening, that part of the Atmosphere which pertains to *WESEN* is the more expanded, and so driven to *WALLENSTAD* directly in the same manner as the Course of the Eastern Wind has been explain'd. And as for the return of the Eastern Wind at Seven or somewhat later in the Evening, he thence infers, that the Portion of the Air which was expanded by the Heat of the Sun, and driven towards *WALLENSTAD*, is by that time returned to its narrow space, and forced, as 'twere by its weight, towards *WESEN*. This Account Dr. *Scheuchzer* gives of the Wind, puts me in mind of his Observation on the Air of this Mountainous Tract. *From repeated Observations* (says he) *on the Height of the Mercury in the Barometer, I gather that the Elasticity of the Air is much greater in these Alpine Countries, than with us at ZÜRICH, which I attribute to its greater Purity; the Explanation whereof I had rather bear from others of better Judgment and Experience, than pretend to it my self, by obtruding my own Conjecture.*

I must not here omit those Observations, he tells us, the *Alpine* People make, concerning the Signs of Fair Weather. Those of *ENGELBERG* expect Rain, when they see the Top of *ST. L-LICSTOCK* cover'd with Clouds; or when they see grey Clouds appear Northward at the Entry of the Valley. In other Places of the *Alps*, an extraordinary Noise and Murmuring of the Torrents is a Token of Rain. At *Filisur* among the *Grisons* they have a Proverb of the Weather, which I Transcribe, because the only Words I have seen in that Ancient Dialect of the *Italians*.

*Curach' il pitz da Stiervi fo chiapi;
Schl lascha der la fotsch, & piglia il rasi:*

WHEN STERWISKNOLL A CAP' DOTH
MAKE;
AWAY WITH STTHE, AND FETCH THE
RAKE.

So at *Novena* near the Fountain of the *Rhine*, a Cloud, great or small, on *Cucarnil* Mountain presages Showers of Rain that Evening or next Morning. At *SIL* in the *UPPER ENGADIN* is a Lake about a Mile in length, and half a Mile broad, on which whenever there are Clouds, 'tis an Infallible Sign of Rain; but he quotes

quotes *J. Leopoldus Cysat* for an Observation (if his Proverb be not an Ironical one) contradictory to these Presages; which is, that *Mons Pilati* at *Lucer*'s betokens Fair Weather when it puts on its Hood. The Proverb shews so much the Identity of the *High Dutch* and *Ancient English*, that it needs no Translation:

WANN DER PILATUS HAT EIN HUT,
SO IST DAS WETTER FEIN UND GUT.

The Rupture with a thundering Noise of the *Alpine* Ice, and the Descending of the *Chamoises*, or *Alpine* Goats, into the lower Mountains, are also look'd upon as Forerunners of Storms. The *PASCHOLER SEE* presages Rain by its rumbling noise; and a small Lake, call'd *Calandari*, is whirl'd about, and swells before an approaching Storm; and roars so loud, as to be heard in the Opposite Mountains and Valleys, to the distance of six Hours; of which *Phanomenon* he gives us the Solution of *Cardan* and *Morbofius*, and lastly offers his own Thoughts. H. 2. p. 24.

In Fair Weather, he tells us, that there's almost continually a *White Cloud* hovering about an Erect Pillar, call'd *DER SEN-NEN STEIN*, near *KUNKEL*'S. These sort of *White Clouds* the Mountaineers call *TROCKEN* and *HEUWETTER, NE-BEL* †; affirming, that such Clouds (from the Appearance whereof they foretel Fair Weather) arise constantly from the Earth; which he afterwards found true himself, in the Ascent of *Speluga* and divers other Mountains. The Pillar above mentioned, he says, is not (as those of *Stonehenge*, and divers other Places throughout *Britain* and *Ireland*) erected by Mens Hands, but Natural; tho' the height of Thirty Foot. This one would think scarce reconcilable with an Opinion he is said to maintain, of an Atomical Dissolution of all Things the Terrestrial Globe consisted of at the Deluge; for if so, we are left to seek, what Mould such a Pillar should be cast in, and thus supported like an Erect Statue, ten Yards above Ground. But the truth is, he has no where hitherto, that I know of, profess'd publicly that Opinion; which has been long since sufficiently exploded in the Ingenious Examination of it. For in his Epistle before the Translation of Dr. *Woodward*'s Essay,

† Viz. Hay-weather Clouds.

he only tells him, that his Book had convinced him, the Fossil Shells, &c. were of Marine Origin; which amounts to no more than what I had publish'd in the *Philosophical Transactions* two Years before that Essay appear'd *, tho' I since humbly propos'd to Mr. Ray's Examination, the Hypothesis you find at the end of the *Lithophylacij Britannici Ichnographia*; which had not he and other Friends thought useful, on Account (whatever may be said of it self) of the Observations attending it, I should not have been in the least fond of Publishing.

6. 2. p. 9.

III. The MOUNTAINS he takes notice of, as most remarkable for their Height, are about an hundred, the Height of a great many whereof he calculates by the Barometer; as particularly that of the Broken Mountain or *Mons Pilatus*, one of the Tops of *Speluga*, *Mons Julius* above *Bevis* [or *Stabulum biviun*] and divers others; tho' according to his wonted Candour, he owns that Method liable to a great many Objections. Some of the *Helvetian* Mountains, most celebrated for Height, are *TITLISBERG*, commonly reputed the highest in all *Switzerland*, the height whereof he computes to be 358 Perches; *SPITZMEIL*, an exceeding High Mountain in *Glaris*; *BAMBERG* or *BANBERG*, to the Top of which, call'd *ECK* and *SURENENECK*, are five Hours almost continual Ascent; whereof above one Hour was thro' Snow, tho' in the Month of *August*. Amongst the *Grisons* he takes notice of *Tcherler Alp*, *auf Ammon*, *Tertserberg*, *Molserberg*, *Segnes Zuor* & *Zout* [i. e. *Upper and Lower*,] call'd by the *Swiss* *Flimserberg*, *St. Joannesberg*, *Heinzenberg*, *Beverin*, *Buntz*, *Caland*, *Calveissen*, *Den Julien*, *Morishen*, *Munton*, *Maloya*, *Monte di Sci*, &c. The Names of these Hills are, as we may guess by some Notes of the Author, so Ancient and Obscure, for the most part of them, as not to be Intelligible to the present Inhabitants. The Word *BERG*, which is the Termination of so many of them, and which might be added to all, is well known to signify *Mountain*; and we find *Alp* [Plur. *Alpen*] to have been anciently another Appellative for any Mountain of extraordinary Height; whence *Obhagalp*, *Hermisalp*, *Ochsenalp*, *Alplein*, *Firnralpen*, *Gersteinralpen*, *Schwentalpen*, &c. The latter of these two Words *Servius* tells us, is

* *Epistola ad D. Christophorum Hemmer M. D. Hafniensem. Act. Phil. Lond. N. 200.*

Celtic, as the other is *Teutonic*. 'Tis doubtless from this known signification of the Word in that Country, that our Author takes the Liberty of using it occasionally in the Singular Number. *WANDT*, whence *DIE WAND*, *DIE GLATTESWAND*, *DIE STAFFEL WAND*, &c. signifies properly a Wall; and is commonly used, as we find by *Rabman's* Verses on the *Chamoise* 1.3. p. 10. Hunters, for any smooth perpendicular Rock. *GRADT* and *ECK*, whatever they may here signify, are also no unusual Terminations in the Names of their Mountains. As *Niesseck*, *Storck*, *Sandeck*, *Schideck*, *Kosereck*; *Seilergradt*, *Plangergradt*, *Eigen-thalergradt*, &c. *Banberg* he supposes so call'd *grac*; *PANBERG*, because of the Penalty inflicted on any one that cuts a Tree thereon, lest by the Fall of Stones, &c. Houses should be destroy'd, and Men and Cattle kill'd or wounded. *Ban* or *Beas* in *Ireland*, *Scotland*, and *Wales*, we call any Hill of extraordinary Height; and peradventure the word here had no other Origin; as their River *Tammina*, which comes from the Pepper-Bath, is perhaps no other than our *Trymyn* warm, which is also the Name of a River in *Montgomeryshire*. Those that have *STOCK* added to their Names, as *GITSCHI STOCK*, *ALPEN STOCK*, *OCHSEN STOCK*, &c. either still are, or have been heretofore Woody; and the same may be said of *WALD* (whence *INTERWALD*, *BAR-NWALD*, &c.) which the *Gauls* seem to have pronounced *Gant*, seeing that in some Parts of *South Wales*, they still use the word in that Sense.

As to the Alteration these Mountains have undergone; that they are made more steep one Age after another, is manifest from the Account of the Inundations of the *Alpine* Torrents. That most Learned and Indefatigable Naturalist *Conradus Gesnerus* has long since given us a Particular Description of the *Broken Mountain*; and I daily expect to see some Additional Observations thereon, in the Ingenious Dr. *Langius* of *Lutern's* History of the Figur'd Fossils of *Switzerland* and the Countries adjoining.

On the 25th of *August* in the Year 1618, a considerable part of a Mountain, call'd *Coma* among the *Grisons*, a small Rock on the side of it being undermin'd by Water, fell down on the Town of *Plurs*, a very Rich and Populous Place; which together with an Inundation of the *Maira* at the same time, so entirely destroy'd it, that there remain'd not so much as the least sign of there having ever been a Town, excepting one Pallace, belonging to the Family of *Wertemar*, still extant; which tho' a stately Fabrick,

L. 2. p. 33. was yet but a Summer-house to a Pallace they had therein. *Casutt*, another Town seated at the Bottom of two Mountains above mentioned, *Maloya* and *Septmer*, was half buried in the Ruins of one of them in the Year 1673; an immense quantity of Blue Clay being born down by a great Storm of Rain in *July*, which had been let at Liberty before, by the melting of the Snow in *April*.

It. 2. p. 46. The steepest Hill he ascended, and that which gave him more fatigue than all the rest, was *FLIMSERBERG*, or (as the *Grisons* call it) *Mount Segnes*; but the most dangerous way was the *WAND ZUR WAND*, almost at the Bottom of *TSCHEINGEL* Mountain. This Passage wants not for Length and Tedioufness; but is moreover so exceeding narrow, that in some Places 'tis scarce three Inches over; and the Rock under it, in many Places bare and almost as steep as a Wall, of the Depth of some Hundreds of Feet. Above it is another continued Wall of Rock; insomuch that the Security of the Passengers, must depend chiefly on their fastning on the Bushes or Trees growing out of the Chinks or Fissures of the Rock above them. Such as are in the least subject to Dizziness are, to avoid such danger, conducted a great way about.

As to the Caves of these Mountains, it should seem they either are not very numerous, or else so common that he scarce thought them worth the mentioning, as affording little or nothing remarkable. These they only call *LOCH'S* [or *Holes*] whereof those he mentions are *GEISSLOCH* and *BRÜDERLOCH*, with the *SILBERLOCH* and *GOLDTLOCH* on the steep Mountain of *Diathelm*; and which is most worth notice, St. *MARTIN'S LOCH*, or rather (as some probably conjecture) *MATTHISLOCH* on the Top of *FLIMSERBERG*, through which the Inhabitants of the Town of *ELM* see the Sun yearly on St. *Matthew's* Day, as through an Optick Tube; concerning which he refers us to *Wagner's Hist. Nat. Curiosa Helvetia* *. He mentions an *Aolian* Cave at *BLATLISBERG* near *WESEN*; but the most remarkable in that kind are those at *Kiavenna*, or (as the *Germans* call it) *CLEFFEN*, amongst which the Inhabitants build those pleasant Cellars, call'd *Grotti*; where in the Summer Time, on account of the continual motion of the Air, the Wine is so exceeding cold,

* *Wagn. H. N. Helv. p. 237.*

that it cannot be drunk in them, but by those of a hardy Constitution, without some hazard of Health. Nor is it safe for Men to continue long in any of them. If a Paper be stuck up in one of these Grotto's; 'tis always bandied to and again with the Wind. They are remarkably warm in the Winter; but in the Dog Days so excessive cold, that in some of them one is scarce able to continue half an Hour. It's no small Labour in the building these Grotto's, to find out the *Spiracula*, or Vent-holes, whereof there are either one, or two, or three, and seldom more in each Cellar. The most cold are those which have their Vent from above. They who enter them Sweating, sometimes catch Agues, or else some other Fever. On account of the Vapours being collected into Drops, the Locks, and any other Irons of the Doors, become Wet on the change of Fair Weather to Rainy. The Liquor included in a Thermometer descended in these Cellars remarkably; and in the Barometer, the Mercury ascended a Scruple and a half.

IV. Having some Years since Publish'd his *Specimen Lithographia Helvetica*, and perhaps designing a *Lithography*, his Observations on Figur'd Fossils are not so numerous as we should otherwise have wish'd; which defect he makes amends for, by taking notice of all the other MINERALS that any where occur'd; which tho' I've reduced to a Catalogue, I omit sending you at present, as not having time to Transcribe it.

The *Strata* of Fossils he tells us, in their Mountains, are not Horizontal, but generally inclining towards the South. He takes notice that the Mines at the *SCHAMS*, and elsewhere among the *Grisons* (the Iron-works excepted) are rarely found in continued Veins; but that the Oar lies scatter'd in Lumps at uncertain Distances; nor are they here, as in the Rich Mine Countries of *Hungary* and *Saxony*, found in the deep Bowels of the Mountains, but near the Surface of them; a Particular Instance whereof he gives us of the Mines near *ANDER*, where the Oar next the Surface is well known to be considerably richer, than that which lies thirteen Fathom deep. He also affirms, that the Grounds where these Oars are, in this *Alpine* Countrey, are exceeding fertile; whereas in *Saxony* and *Hungary* such places are generally barren; the Grass being shrivel'd up by the Exhalations of their Rich Mines, which the *Alps* do not seem to abound with; and where those they have,

the Layers are of exceeding thick Stone, which suppress those Noxious Streams.

V. His Observations on PLANTS being very numerous and Curious; and on such as are for the most part, unknown to me; I can say little or nothing to them. His *Græmen montanum spicâ foliacea graminæa* Raij, which I have often seen at *Snowdon* and our other High Mountains, is well represented in his IVth Table f. 2. as is also his *Saxifraga Alpina ericoides flore cæruleo* Tourn. whereof they have great Plenty at the *Van* above *Brecknock*, as well as at *Snowdon* and *Ingleborough*. The Moss-figur'd *Iter*. 1. Tab. VI. fig. 2. which he entitles a Variety of Mr. Ray's *Muscus terrestris repens clavis singulis viribus erectis foliosis*, seems referable rather to the *Muscus abietiformis*; and indeed from the Figure, I should take it for no other than our common *Fir-Moss*; as I should the 1st Figure of the same Table for our *Muscus terrestris Polypermon*; because the Fangs by which it creeps, and which would sufficiently have distinguish'd it, are not express'd. I find our High Mountains of *Wales* and *Ireland* afford several Plants not yet discover'd in these *Alps*; and perhaps those of the *Highlands*, none of which, tho' they are numerous, have been yet search'd, may afford some others; or at least some *Alpine* Plants not yet discover'd to be Natives of *Britain*. But on the other hand, the *Alps* afford much more Variety than we can pretend to. By the Mountains he mentions as abounding with Plants, and his Account of the height of them, I find that their Highest Mountains, as well as ours, afford the greatest Variety of these *Alpine* Plants. You have found, Sir, by Experience, that the Mountains of *San Lexid* and *San Erys* in *Carnarvonshire*, afford more sorts of *Alpine* Plants, than have been as yet discover'd on all the other Mountains of the Isle of *Britain*; and that amongst the Rocks of those Mountains, *Klwyyn Karned i Dyffwrth*, which being under the Peak of *Snowdon*, is the very Highest of them, has the most Variety; and indeed where such High Mountains want naked Rocks, the *Alpine* Plants they afford, are but few; as I have experienced by *Pym*, *Lycon*, *Kader Fern*, and the Mountains of *Brecknock*. Those he most takes notice of in *Switzerland* for Rare Plants are the *ECKE*, *SURE VENECK*, *TITLISBERG*, *IOCH* [or the *Tuke*] *ENGELBE G*, *OCHSEN STOCK*, and *WALDNACHT*; and among the *Grisons*, *Spelunca*, *Monte de Set*, *Monte de Soglio*, *Segnes*, and

and *Malogia*; not but that the other Mountains he names, may have probably the same Plants; but amongst those he search'd, these afforded the best Satisfaction.

The *Alps*, he tells us, above a certain Height, produce no Trees; and it should seem that even in their Fertile Valleys, some sorts do not grow so high, as they do elsewhere, seeing he looks upon: as a Thing very Extraordinary, that a Hawthorn on the Bank of the *Rhine* near *ROTHENBRUN*, should arrive at the height of almost Ten Foot

On *Guntzen* Mountain above *Sargans*, the *Beech Wood* is observed to be harder and heavier than elsewhere; and much more wreath'd and knotty. The Inhabitants attribute this Hardness, &c. of the Wood, to the influence the Steams of the Iron and Steel Oars of that Mountain, may have on the Trees: Which reason (says he) we need not too hastily reject; when we have consider'd that Wood by steeping it in Chalybeate Waters, is render'd so hard as in a great measure to resist Iron. Another Observation he has on Timber, is that the Deal of the Red Fir, which grows on the highest Forests of *GLARIS*, and is therefore call'd *HOCH-WALDER HOLZ*, or Upwood Timber, is lighter and more Porous, and so fitter for Cabinet Works and Musical Instruments, than any other. The Circles, or (as they are commonly call'd) Years, are closer; so that those Trees of *GLARIS* are of a less Diameter than such as grow at *ZURICH*, tho' of the same standing.

VI. As to ANIMALS, his Industrious and Deservedly Famous Predecessor *Gesner*, having left him little to say; and his method being to pass by (as I have before observ'd) whatever has been well perform'd by others; we had but little to expect here, besides the following Account he gives of the *Chamoises*, or as the *Grisons* call them *Chiamuotisch*. About the *Pepper-Burb*, says he, The High Mountains of *Galand*, the *Gray Horns*, and several other *Alps* abound with Herds of the *Chamoises*; some Account of which I must not omit on this occasion, which has so often afforded plenty of their Venison. Amongst other Notes which *Gesner* has of these Animals*; One is, That they meet often about certain Sandy Rocks,

* *Lib. 1. p. 331.*

and whence look at St. John's Table little do Salt, in order to cleanse their Tongues and provoke Appetite. The Alpine SWIZZERS call such Stones SULZEN, as if Salt; and it is usual for the Huntsmen to have these Stones in some Private Shelters near them, that so they may be ready to rub their Guns, whenever they come to luck. Also Gesner in his Natural History of Switzerland, mentions Rocks impregnated with Nitre, resorted unto by the Chamoises. Such Places, says our Author, are not uncommon in the Alps; so worn for many Ages by the Tongues of Beasts, that even the Rocks are much hollowed. The Gijsons call it GLACK, and those of Glaris and the other Swizzers, LACKINEN and SULTZ LACKINEN. But such Stones are not, or at least but very few of them, impregnated with any Salt; but somewhat Gritty and Friable, inasmuch that they can easily lick off Sand from them. But whether they do this to excite the Appetite, or to rid their Tongues of Slime, or else to promote Digestion, is what he will not undertake to determine; but affirms it is certain, that when they cannot come at such Places, they'll take up with any Earth or Sand that comes in their way; as will also sometimes the Cows and Goats. "When they are hunted, says Gesner, they constantly ascend, till they get into such high Steep Rocks, as are Inaccessible to the Dogs; where Dr. Schenckzer takes notice, that in these Days, they use no Dogs in the Hunting them: And whereas Gesner says, that when taken, they may be tamed; he says, he could not mean those that were full grown, but their Young ones; which, if only a few Days or Weeks old, are easily caught, because they cannot follow the Hind. If older, their Method is, when a Huntsman shoots one of the Old ones sucking her Young, he lies down on the Ground, and holding her up as well as he can on the four Feet, the Young one coming to Suck, is snatch'd up and carried home bound; and even sometimes the Slaughter'd Goat on the Huntsman's Back, is enough to allure the Kid to follow him down to his House. These Kids (or rather as some others would call them Fauns*) being brought home, are fed with the Milk of Domestic Goats, whereby they become so tame, that they afterwards

* Raj. S. 1095f. *Meth. Quadrup. & Serp.* p. 78 Quod ad formam corporis hoc animal ad cervinam nobis accedere visum est.

herd with them in the *Alpine* Pastures, and also return to the Cots at their Dairy Houses: Tho' sometimes they forsake the Lower Pastures, and betake themselves to the Highest Rocks, as Places more agreeable to their Nature. They generally wander about the *Alps* in Herds; but not without some Order. They have a Leader, whom the Huntsmen call the *VOR-GEIS* or *Fore-Gout*; which standing on some remarkable Eminence, listens diligently with erect Ears, whilst the rest are feeding, looking about on all sides at the least noise: And if it hears or sees any thing, it alarms all the rest with a kind of Whistle; all which, after twice or thrice cropping whatever they feed upon, lift up their Heads, and take their Flight to some other Place. And thus they never live secure, excepting in the inaccessible Roc's, in the Winter Time, or at Night. They are no less careful in preserving the Lives of their Kids than their own; and therefore defend them with all possible Diligence from the Vultures; which when very Young and Tender, are apt to snatch them in their Claws, and when somewhat Older, by beating them with their Wings on the Shelves of the Rocks, to force them down Precipices, that they may afterwards Prey on them. They also take especial care, not to bring them to any dangerous Rocks, till they have had some Experience in Climbing and Leaping.

In the Winter they lodge themselves under such Parts of the Rocks as are hollow or shelving about the midst of the Mountains, which secures them from the danger of being invol'd in those vast Heaps of Snow, that so frequently slide down the *Alpine* Roc's; during which time their Food is either the Roots of Herbs, the Sprigs of Trees and Shrubs, or Green Herbs which the snow had cover'd. The other part of the Year, they feed in Sunny Places; but before Sun-rising, and after Sun set, they either lie in the Snow, or under the Shadows of the Rocks. They who hunt these Beasts have a very laborious as well as dangerous Task. The high and steep Ridges of the *Alps* must be climb'd, thro' Horrid Rocks and Clefts, to other Mountains, and over Perennial Ice and Frozen Snow; for which reason they walk with Iron instruments fasten'd with Tongs to the Soles of their shoes. It happens that sometimes standing on a narrow Shelf of a Rock, having scarce half the breadth of their Feet to support them, they drive a *Chamoise* to that Pass, that it has no other way but that most narrow Passage to escape. In such an Accident, either the Beast is shot by the Huntsman, or else it endeavours to make

its Escape by him ; in which case the best Course he can take, is so to close up his Body to the Rock, that there be no Intermediate Space ; so that then the Beast returning on the outside, the Huntsman is safe himself, and most commonly forces the *Chamoise* down the Precipice. But if it should perceive the least vacant space, betwixt the Man and the Rock, it endeavours to enter it with such force, that the Man is thrown down' Headlong. To such necessity are these Men sometimes driven, that in order to save their Lives by Leaping, they are obliged to take off their Shoes and slash their Heels with a Knife, that their Feet being Bloody, may be the more Clammy, and so not so apt to slide. It's remarkable, that when these Goats are thus pursued, they will rather stand still and expose themselves to be shot by the Huntsman, than enter a *FIRN*, or Rock, as it may be call'd, of Perennial Ice, especially those of a Blue Colour, unless they should be cover'd with Snow, by which means a *Grison*, not long since, shot three of them in the space of one Hour. These Huntsmen expect the best Success when the Wind is in their Faces ; for if it be with them they smell the Powder, and even Men, tho' they should not have any about them, at a very great distance, which immediately sets them a running. And indeed were it not a thing well known, that they excel in the Sense of Smelling, the Largeness of their Olfactory Nerves would be a sufficient Indication of it.

It. 2. p. 21. As for that sort of *Tepho* or Ball found in the Stomachs of these Animals, those that live on the *Galand* seldom or never have any of them ; which the Mountaineers attribute to the Barrenness of those Rocks. However that the *Chamoises* of one Mountain are much more apt to have them, than those of another, is what all the *Alpine* Huntsmen agree in ; and it's well known, that in the Northern Mountains of *RHINWALD* they never have any ; whereas those of the Southern, after they are three Months old, seldom or never want them.

It. 1. p. 19. In the Year 1699, it happen'd that one of these Goats quitting its own Kind and Native Soil, which is always the Highest *Alpine* Rocks, descended to the Lower Pastures in the Valley of *ENGELBERG*, and there herded among the Cows and Horses, nor would by any means be driven away. A Neighbouring *Chamoise* Hunter, surprized to hear a thing so unusual, gets his Gun and does that without any Trouble, which at other Times had cost him a great deal of Fatigue. A Curious Gentleman, being desirous

desirous to learn the Cause of a Thing so unnatural, dissects it, and finds the *Dura meninx* cover'd with an *Hydatis* full of Serum and small Sand; whence it appear'd, that this *Chamoise* had the *Vertigo* or Giddiness, seeing that such an *Hydatis* is well known in all Countries, to be the Cause of it in Cows and Sheep. When the Cows are troubled with it in the Alps, the Effect it often has, is that they turn themselves about continually, making at any place where they hear the noise of Water, until they come to the Bank of that Brook or River, where neglecting their Food, they stand flock still, as if delighted with the sound.

Thus, Sir, I have given you some small Account of that Part of the Author's Observations, that regards *Natural Philosophy*, properly so call'd; all which (together with the other Part of the Work) is illustrated with about 40 Copper Plates. As to those he has on the Customs and Industry of the People; on the Diligence of the *Grifons* in repairing the *Alpine* Roads; on some late Improvements in *Agriculture* and *Gardening*, and the *Antiquities* he takes occasion to mention, I leave them to your Perusal in his own Words; adding only, that to me he seems a Person of no less Candour than Learning, and that I doubt not, but making Allowance for the Interrupted Transitions, unavoidable in a Diary of such Variety of Subjects, you'll find the Perusal of the remaining Part of the Work, agreeable. At least I must acknowledge the whole appear'd so to, .

Oxford,
April 3d.
1708.

Honoured S I R,

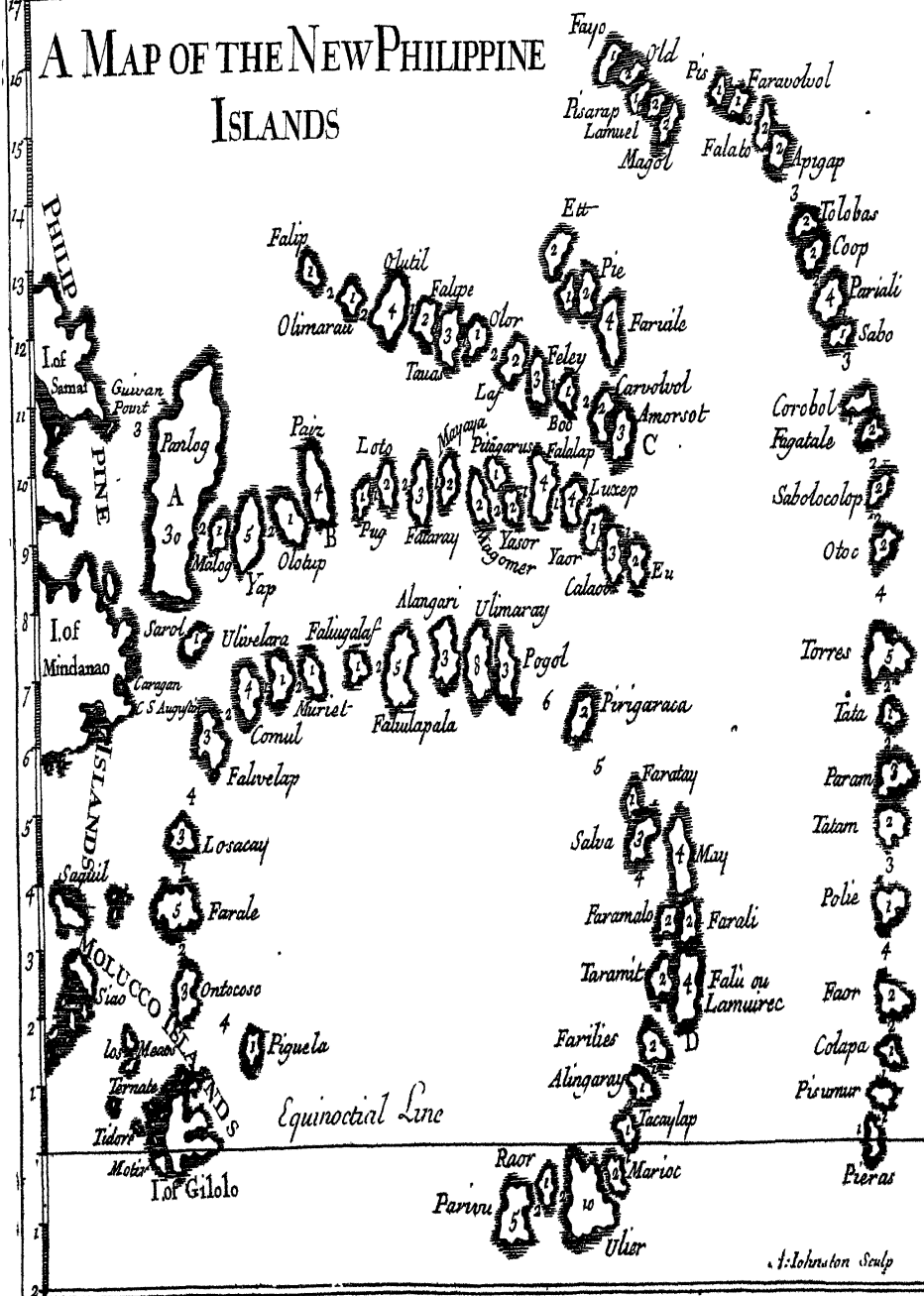
Your most Humble Servant,

E. Lhuys.

L O N D O N,

Printed for Henry Clements at the Half Moon in.
St. Paul's Church-yard. MDCCLXXX.

A MAP OF THE NEW PHILIPPINE ISLANDS



PHILOSOPHICAL TRANSACTIONS.

For the Months of September and October, 1708.

The CONTENTS.

- I. *A Relation of an Idiot at Ostend; with two other Chirurgical Cases. By Mr. Claud. Amijand, in a Letter to Mr. Wilson: Communicated by Mr. de la Fage.*
- II. *Jo. Keill ex Æde Christi Oxonienſis, A. M. Epistola ad Clarissimum Virum Edmundum Halleium Geometriæ Professoreſſem Savilianum, de Legibus Virium Centripetarum.*
- III. *An Extract of Two Letters from the Missionary Jesuits, concerning the Discovery of the New Philippine Islands, with a Map of the same.*
- IV. *A Relation of a New Island thrown up near the Island of Santerini; sent to the Marquis of Ferriol, Ambassador Extraordinary of France, at the Ottoman Port. Taken from the Memoirs of the History of Arts and Sciences at Trevoux, for the Month of July, 1708.*

I. *A Relation of an Idiot at Ostend ; with two other Chirurgical Cases. By Mr. Claud. Amijand, in a Letter to Mr. Wilson : Communicated by Mr. de la Fage.*

Ghent, January the 30th, N. S. 1708.

TIS now about five Weeks, since an Idiot from his Infancy died at *Ostend*, the place of his Birth, in the 33d Year of his Age ; his Death having been preceded with twelve Days continual remitting Fever, and a considerable Tumour and Pain about the Region of the Liver. His Brother, in whose House he had been a constant Dweller, being desirous to know the Cause of it, desired Mr. *Ricks*, an Eminent Surgeon, (who at that time had the Cure of me) to open him ; but as the Aperture was to be perform'd *gratis*, he put it off, and sent his Son, likewise Master Surgeon of the same City, with his Servant ; who did the Work in presence of the Brother of the Deceased and a Nun, brought thither by the desire of discovering the Cause of her Spitting or Vomiting of Blood, to which this Fellow had been very liable, (as well as to bloody Stools) for six Weeks before his Death. A large Abscess or Imposthume was found in each Lobe of the Liver, whose Bulk did far exceed the ordinary Stint. The Brother was satisfied with this Discovery, and would have had the Surgeon to seek no further ; but he was persuaded, at the pressing Sollicitations of the Nun, to let the Stomach be opened, which was found extremely contracted and ponderous ; and indeed it was thought no Wonder, when
upon

upon the aperture of it, was found a Bundle of the things following, closely involved and embraced by the Stomach, *viz.* Nine Cart-wheel Nails, and six lesser; a large and long Iron Screw; two pair of Compasses, the one having a Circle two Inches in Diameter; a middle-size Key; a large Iron Pin, as big as my Thumb, and 4 Inches long, with a Ring at the end on't; another of Brass, but much less; the Handle of an Iron Spring-Knife, (swallow'd as 'tis believed intire, but the sides and two pieces making up the Spring of it, found asunder; the Pegs of the Knife, tying those several pieces together, were not found;) the upper and lowermost end of a Brass Pommel, inservient to a Sea-coal Grate, weighing nine Ounces; a broad piece of Lead weighing three Ounces and a half: the whole consisting of 28 Pieces, weighing betwixt two and three Pounds. Some of these were lost, and mightily sought for by his Brother soon after the Siege of *Ostend*, and the rest at different Times since; they were found all in a Bundle with the largest Ends one way, and the smallest the other; the small End of one of the large Nails was so bent, that it would have made a perfect Circle, had not the very tip of that same Nail been bent back again; this End was forked and wonderfully sharp, as were likewise the Ends of the Compasses. None of the Pieces were found polish'd, neither cou'd I find the Brass nor the Lead any ways impar'd or endamaged; but the Iron pieces were extremely corroded, especially one of the Sides of the Knife, which had lain in the Stomach about 8 Months, was eaten quite thro' in two or three places, towards the Blade's End; and three or four Nails mightily indamaged did appear as if some particular *Menstruum* or Dissolvent had been poured upon them, capable only to dissolve that Metal, as *Aq. regalis* has the Property to dissolve Gold, *Sp. Nitri* Silver, *Vinegar* Lead, leaving those other Metals joyned and alienated with them untouched

touch'd : the Lead had lain in the Stomach about eight Months, and the Brass Pin above-mentioned above twelve. It was very easy to guess at the time those different pieces of Iron had been in the Stomach, in considering how much one piece had suffered more than the other. This Observation is like to give a check to the Notion of those who believ'd that Ostridges did dissolve Brass and Iron by Friction only ; for if so, I see little reason why the Iron Branches of the Compasses should have been found so very much worn out, and the Brass Branches not in the least impair'd. Mr. *Ricks's* Son, who open'd him, told me, That the Stomach had been no ways wounded or indamag'd ; which does not appear to me probable, when the Patient was known to have vomited and evacuated Blood by Stole for six Weeks before he dyed, as I have already mention'd. It could have been wish'd the Gullet and Guts had likewise been open'd ; for 'tis plain, some of the Pieces had passed the *Pylorus*, as the Pegs of the Knife ; and perhaps some smaller Pieces than those that were found in the Stomach, might have been forc'd thither. It's necessary to remark, That this Fellow, from his Youth, had accusom'd himself to swallow large Morfels, Glutton like, and without Chewing ; which, no doubt, made the Passage of the *Oesophagus* wider, and disposed it to give Entrance to all those Extraneous Bodies. It may be also taken notice, That this Idiot, and sometimes Mad Fellow, was never known to Seep a Wink, tho' he was often compell'd to go to Bed, and had, to incline him to Sleep, been very much harass'd and fatigu'd before : he was always known to eat three times as much as the rest of Mankind, and when furious, to grow quiet upon the approach of Meat.

Mr. *Vandenheyde*, another famous Surgeon of *Ostend*, did procure me the sight of the largest Tumour I ever yet saw, which is the second Case I have promised to describe

scribe to you. This Tumour is of a Schirrous Nature, springing from the Thigh-bone, somewhat tending to that of a Cancerous. It first took its rise about two Years ago, in a Child of 10 Years Old, just above the *Patella*, without any evident cause, and hath, notwithstanding all possible care, expanded it self so, that it now occupies the whole Thigh to the very Groin, and has extended it to above a *Dutch Yard* in Circumference. As it encreases very much daily, it must soon exhaust the Patient's Strength. The Surgeon intends to open him, and to make, after his Death, two Draughts, the one of the Tumour, and another of what he shall discover in the Dissection; and has promised to send them both to me with a Relation, to get inserted in Dr. *Ruyseh's* Observations, with the former Account: If they keep their Word, I shall take care to have them communicated to you in time.

Whilst I am upon these odd Cases, I can't but take notice of a very remarkable Fracture of the Skull, we had last Campaign in our Hospital here; it was in the interior part of the *Squamosæ* Bone, and occasioned by a Splinter of a Fellow Soldier's Piece bursting, that struck him there. Some time had pass'd, before the Accidents made us suspect a Fracture, and obliged us to make a Triangular Incision upon the Temporal Muscle; a Fissure was discover'd, which indicated the Necessity of the Trepan. It was apply'd twice, the first not making room sufficient to extract a large piece of the internal Table very much depressed. After this all the Accidents disappear'd; but twelve Days after the Operation, Rigors, cold Sweats, an intermitting Pulse, and some other Signs of an approaching Death, did make us despair of the Recovery of our Patient. He died the 15th from the Operation, and about the 20th from his Wound. His Skull was open'd, and in it three very remarkable Fissures observed. The first had, notwithstanding the

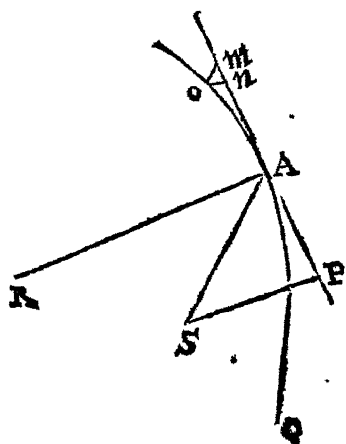
Sagical Suture, crois'd from one Parietal-Bone to the other, as far as the Coronal Suture on that side opposite to the Wound; another had gone cross the Coronal Bone; and the third was on the Parietal Bone on the side of the Wound, pretty near the *Sutura Squamosa*; but what is most singular, is that none of these Fissures did reach that, upon which the Trepan had been applied. An *Empyema* was found in the *Thorax*, and a considerable Imposthume in the Liver.

II. *Jo. Keill ex Aede Christi Oxoniensis, A. M. Epistola ad Clarissimum Virum Edmundum Halleium Geometriae Professorem Savilianum, de Legibus Virium Centripetarum.*

HAUD oblitus es, uti arbitror, Vir Clarissime, te cum nuper esses Oxonii, Theorema, quo Lex vis centripetæ, *Quantitatibus fixitis* exhiberi possit, mecum communicasse: Quod Theorema tibi monstravit Egregius Mathematicus D. Abrahamus De Moivre, Dixitque Dominum Isaacum Newtonum, Theorema huic simile prius Invenisse. Cum autem ejus demonstratio persacilis sit, Eam, itemque alia de eadem re cogitata, non possum tibi non impertire. Etsi minime dubitem, quin, si idem argumentum pertractare libuisset, tu acerrimo quo polles ingenij acumine, rem omnem penitus exhaustire potuisses.

T H E O R E M A.

Si corpus Urgente vi Centripetâ in curva aliqua moveatur ; Erit vis illa in quovis curvæ puncto, in ratione composita ex directâ ratione distantie corporis à centro virium, & reciproca ratione Cubi perpendicularis à Centro in rectam in eodem puncto Curvam Tangentem demissa, ducti in Radium Curvature quem ibi obtinet curva.

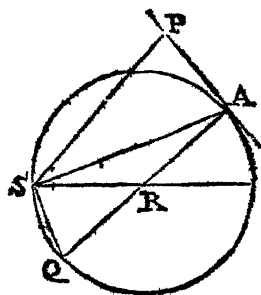


Sit Q A O Curva quælibet à mobili urgente vi centripeta ad punctum S tendente descripta. Sitque A O arcus in minimo quovis tempore percursus, P *m* ejus tangens, A R Radius circuli æquicurvi, hoc est cujus Peripheriæ pars minima cum Arcu A O coincidat. Et sit S P recta à puncto S in tangentem perpendiculariter demissa ; Ducantur O *m* ad S A & O *n* ad S P Parallelæ. Et expōnat O *m* vim

qua mobile in A urgetur versus S. Vis qua perpendiculariter à tangente recedit corpus, erit ut O *n*, id est vis tendens versus R & faciens ut mobile, eadem qua prius velocitatē latum, describet circulum æquicurvum arcui A O erit ad vim tendentem versus S, qua corpus in curva A O movetur, ut O *n* ad O *m*, vel ob æquiangula triangula ut S P ad S A. Sed corporum in circulis latorum vires centripetæ sunt ut quadrata velocitatum applicata ad Radios ; per Corol. Theorem. 4. Princip. Newtoni.

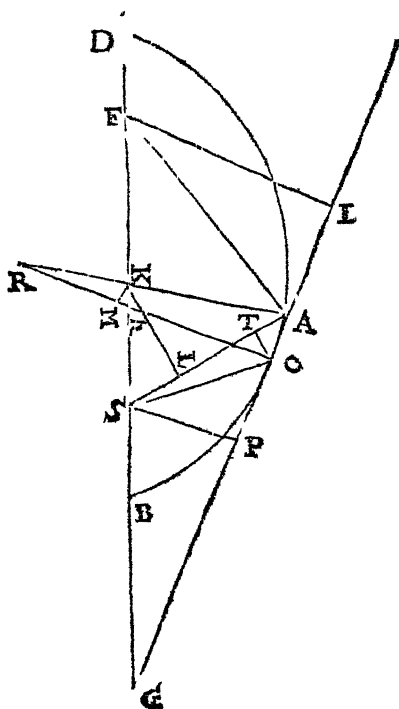
Est vero velocitas reciproce ut SP , five directe ut $\frac{1}{SP}$
adeoque quadratum velocitat. erit ut $\frac{1}{SP^2}$: vis igitur ut On ,
five vis qua in circulo æquicurvo moveri potest corpus,
erit ut $\frac{1}{SP^2 \times AR}$: Ostensum autem est, esse SP ad SA
ut vis tendens versus R , qua corpus in circulo æquicurvo
moveri potest, ad vim tendentem versus S : sed est vis
tendens versus R ut $\frac{1}{SP^2 \times AR}$, adeoque cum sit
 $SP : SA :: \frac{1}{SP^2 \times AR} : \frac{SA}{SP^3 \times AR}$ erit vis tendens
versus S , ut $\frac{SA}{SP^3 \times AR}$. *Q. E. D.*

Cor Si curva QAO sit circulus, erit vis centripeta tendens
versus S , ut $\frac{SA}{SP^3}$. Adeoque si
vis centripeta tendat ad S punctum in circumferentia situm,
erit [per 32 tertii] ang. PAS
 $=$ ang. AQS ; adeoque ob similia triangu-
la ASP , ASQ ,
erit $AQ : AS :: AS : SP$:



unde $SP = \frac{AS^2}{AQ}$ & $SP^3 = \frac{AS^6}{AQ^3}$ unde $\frac{SA}{SP^3} =$
 $\frac{SA \times AQ^3}{AS^6} = \frac{AQ^3}{AS^6}$, hoc est, ob datum AQ , erit vis
reciproce ut AS^6 .

Sit D A B, Ellipsis cu-
jus Axis D B, foci F & S,
A R, O R duæ perpen-
diculares in curvam fibi
proximæ: ducantur KL,
O T in S A, & K M in
O R perpendiculares.
Quia S A : S K :: (a)
F A + S A : F S, hoc
est data ratione, erunt
rectarum S A, S K Flux-
iones A T, K k ipsis S A,
S K proportionales; & est
 $AL = \frac{(b)}{2}$ lateris Recti
 $= \frac{1}{2} L$. Porro ob K A
ad S P parallelam, est
angulus A S P = K A L
= T O A ob ang. T A O
utriusque complemen-
tum ad rectum: quare
K A : A L :: S A : S P,
unde $S P = \frac{L}{2} \times \frac{S A}{K A}$ &



$K A = \frac{L \times S A'}{2 S P}$. Porro ob æquiangula triang. K M k,
G P S & O T A, S P A.

Est K M : K k :: G P : G S :: A P : S K

Item K k : A T :: S K : S A

Item A T : A O :: A P : S A

Erit K M : A O :: A P : S A :: S A : S P

$:: S A - \frac{L^2 \times S A^2}{4 A K^2} : S A :: (4 A K^2 - L^2) : 4 A K^2$,

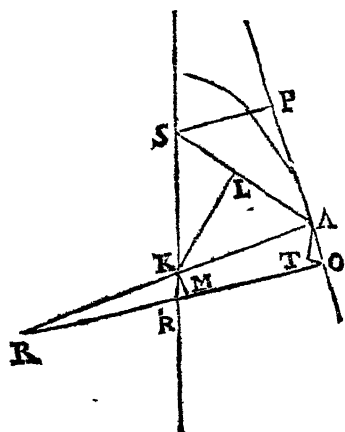
unde $L^2 : 4 A K^2 :: (A O - K M : A O ::) A K : A R$

(a) Prop. 3. El. 6ti. (b) Prop. 6. partis 4ta Sect. Con. Milnij.

ac proinde $AR = \frac{4 AK^3}{L^2}$. Eodem prorsus ratiocinio

Invenietur Radius Curvaturæ in Hyperbola æqualis

$$\frac{4 AK^3}{L^2} = \frac{L \times SA^3}{2 SP^3}.$$



In Parabola vero facili-
or est calculus. Nam ob
datam subnormalem, est
 Kk semper $= AT =$ Fluxi-
oni Axis; & triangu-
la KkM, ATO, SPA, AKL ,
æquiangula, unde KM :
 $Kk :: AP, SA$, item est
 AT vel $Kk : AO :: AP : SA$,
unde $KM : AO :: AP^2$
 $: SA^2 :: SA^2 - SP^2 : SA^2 ::$
unde erit $SP^2 : SA^2 :: AO$
 $- KM : AO :: AK : AR$,

$$\text{ac proinde } AR = \frac{SA^2 \times AK}{SP^2};$$

sed est $AL = \frac{1}{2}$ lateris Recti $= \frac{1}{2} L$, & $AK : AL :: SA : SP$,
quare erit $\frac{L \times SA}{2 AK} = SP$, & $SP^2 = \frac{L^2 \times SA^2}{4 AK^2}$, quare e-

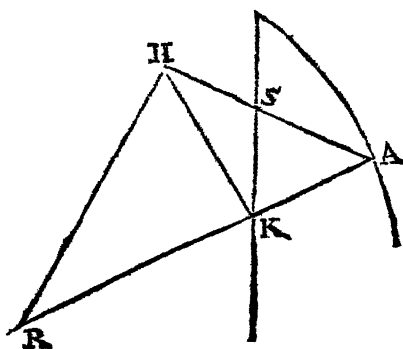
rit $AR = \frac{4 AK^3}{L^2}$, vel quoniam est, $AK = \frac{L \times SA}{2 SP}$,

$$\text{erit } AR = \frac{L \times SA^3}{2 SP^3}.$$

Atque ex his facilissima oritur constructio, pro determi-
nando Radio curvaturæ in quavis Sectione Conica. Sit
enim AK perpendicularis in Sectionem occurrens Axi in
 K , ex K super AK erigatur perpendicularis HK , cuius
 AS producta concurrens in H . Ex H erigatur super
 AH , perpendicularis HR , erit AR radius curvaturæ.

In

In Parabola paulo simplicior adhuc evadit constructio. Nam quoniam ex natura Parabolæ est $SA = SK$, & ang. AKH rectus, erit S centrum circuli per $A K H$ transeuntis, unde invenitur Radius curvaturæ producendo SA in H , ut $SH = SA$, & in H erigendo perpendiculararem HR ; Et R erit centrum circuli osculantis Parabolam in A .



Vis Centripeta tendens ad focum Sectionis Conicæ in qua corpus movetur, est reciproce proportionalis quadrato distantiae. Nam quoniam

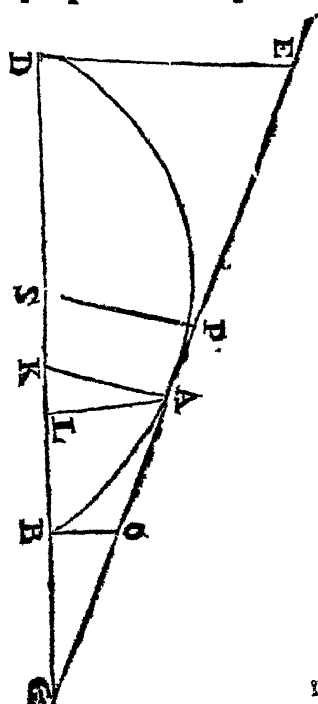
$$AR = \frac{L \times SA^3}{2 SP^3} \text{ erit } \frac{SA}{SP^3 \times AR}$$

$$= \frac{SA \times 2 SP^3}{SP^3 \times L \times SA^3} = \frac{2}{L \times SA^2}$$

hoc est ob datam $\frac{2}{L}$ erit vis

centripeta ut $\frac{1}{SA^2}$.

Sit Ellipsis BAD quam tangit in A recta GE . Sintque SP per centrum Ellipsis & KA per contactum, transeunt, perpendicularares in tangentem. Erit $SP \times KA =$ quartæ parti figuræ Axis seu quadrato semiaxis mino-



ris = $BO \times DE$. Nam ob æquiangula triang. GBO , GLA , GAK , GPS & GDE ,

$$SP : SG :: BO : GO$$

$$SG : DG :: BG : LG :: GO : GA$$

$$DG : DE :: GA : AK,$$

unde $SP : DE :: BO : AK$; & $SP \times AK = DE \times BO = L \times SB$.

Hinc si Mobile moveatur in Ellipfi, vi centripeta tendente ad centrum Ellipsis, erit vis illa directe ut distantia; Nam est $\frac{SP^3 \times 4AK^3}{L^2} = \text{dati quantitatis}$. Quia

est $SP \times AK$ quantitas data. Vis igitur, ut $\frac{SA}{SP^3 \times AR}$, erit ut SA distantia.

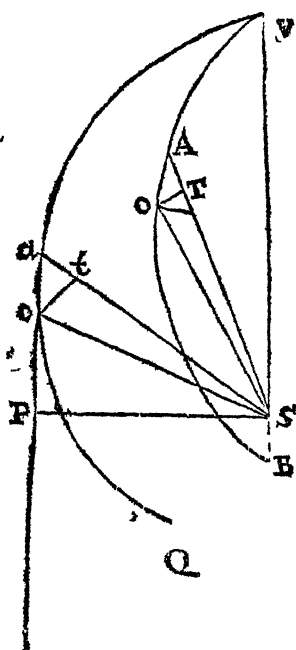
In figura tertia Demissa ab altero umbilico F : in Tangentem Perpendiculari FI . Qb æquiangula Triangula SAP , FAI , erit $SA : SP :: FA : FI = \frac{SP \times FA}{SA}$,

unde erit $SP \times FI = \frac{SP^2 \times FA}{SA} = \text{quadrato semiaxis minoris}$: unde si Axis major vocetur b , minor autem d , erit $SP^2 = \frac{d^2 SA}{b - SA}$ & $SP = \frac{d SA^{\frac{1}{2}}}{\sqrt{b - SA}}$.

In Hyperbola autem est $SP = \frac{d SA^{\frac{1}{2}}}{\sqrt{b + SA}}$.

In Parabola est $SP = \sqrt{d SA}$, posito ejus latere recto $= 4d$.

Quoniam est $TA^2 : TO^2 :: AP^2 : SP^2 :: SA^2 - SP^2 : SP^2 :: SA^2 - \frac{d^2 SA}{b - SA} : \frac{d^2 SA}{b - SA} :: SA - \frac{d^2}{b - SA} : \frac{d^2}{b - SA} :: bSA - SA^2 - d^2 : d^2$, erit $\sqrt{bSA - SA^2 - d^2}$.



Exemplum. Sit VAB Ellipsis cujus focus S , Axis major $VB = b$, Axis minor $= 2d$, latus Rectum $= 2R$. Sitque $V a Q$ alia curva, ita ad hanc relata, ut sit perpetuo angulus VSA angulo VSa proportionalis, & sit $Sa = SA$. Quæritur lex vis centripetæ tendentis ad S , qua corpus in curva $V a Q$ moveri potest.

Quoniam ang. VSA est ad VSa , in data ratione; horum angulorum incrementa erunt in eadem ratione, sitque ea ratio m ad n ; unde erit $ot = \frac{n \times OT}{m}$.

$$\text{Est autem } OT = \frac{dSA\dot{A}}{\sqrt{bSA - SA^2 - d^2}}$$

$$\text{unde erit } ot = \frac{n d S \dot{A}}{m \sqrt{bSA - SA^2 - d^2}}.$$

$$\begin{aligned} &\text{Quoniam autem est } SA^2 + SP^2 : SP^2 :: t^2 + ot^2 : ot^2 \\ &:: S\dot{A}^2 + \frac{n^2 d^2 S \dot{A}^2}{m^2 bSA - SA^2 - d^2} : \frac{n^2 d^2 S^2}{m^2 bSA - SA^2 - d^2} \\ &:: 1 + \frac{n^2 d^2}{m^2 \times bSA - SA^2 - d^2} : \frac{n^2 d^2}{m^2 \times bSA - SA^2 - d^2} :: \\ &m^2 bSA - m^2 SA^2 - m^2 d^2 + n^2 d^2 : n^2 d^2, \text{ unde erit} \\ &\sqrt{m^2 bSA - m^2 SA^2 - m^2 d^2 + n^2 d^2} : nd :: SA : \\ &SP, \text{ \& } SP = \frac{ndSA}{\sqrt{m^2 bSA - m^2 SA^2 - m^2 d^2 + n^2 d^2}}. \\ &\text{Cujus ut habeatur fluxio pro } m^2 bSA - m^2 SA^2 - \\ &\hspace{15em} m^2 \end{aligned}$$

$m^2 d^2 + n^2 d^2$. Scribatur x & erit $SP = \frac{n d SA}{\sqrt{x}}$,

& $SP^2 = \frac{n^2 d^2 SA^2}{x^{\frac{1}{2}}}$; & est $\dot{x} = m^2 b SA - 2 m^2 S A S \dot{A}$,

& $S \dot{P} = n d S \dot{A} \times x^{-\frac{1}{2}} - \frac{1}{2} \frac{n A S A \dot{x}}{x^{\frac{3}{2}}}$, & redu-

cendo partes ad eundem denominatorem; erit $S \dot{P} = \frac{n d S \dot{A} x - \frac{1}{2} n d S A \dot{x}}{x^{\frac{3}{2}}}$. Et in numeratore loco, x &

\dot{x} , ponendo ipsorum valores, & ordinando fit $SP = \frac{n d S \dot{A} \times \frac{1}{2} m^2 b SA - m^2 d^2 + n^2 d^2}{x^{\frac{3}{2}}}$, unde erit $\frac{S \dot{P}}{SP^2 \times S \dot{A}}$

$= \frac{\frac{1}{2} m^2 b SA - m^2 d^2 + n^2 d^2}{n^2 d^2 SA^2}$. Sed est $\frac{S \dot{P}}{SP^2 \times S \dot{A}}$,

ut vis centripeta, quare erit vis, ut $\frac{m^2 b SA - m^2 d^2 + n^2 d^2}{n^2 d^2 SA^2}$

vel ob datam $n^2 d^2$ in denominatore erit vis, ut $\frac{\frac{1}{2} m^2 b SA - m^2 d^2 + n^2 d^2}{SA^2}$, vel loco d^2 ponendo $\frac{b R}{2}$,

erit vis ut $\frac{\frac{1}{2} m^2 b SA - \frac{1}{2} m^2 b R + \frac{1}{2} n^2 b R}{SA^2}$, seu ob

datam $\frac{b}{2}$, ut $\frac{m^2 SA - R m^2 + R n^2}{SA^2} = \frac{m^2}{SA^2} +$

$\frac{R n^2 - R m^2}{SA^2}$. Quæ omnia exacte coincidunt, cum iis

quæ à Domino Newtono de vi centripeta corporis in eadem curva moti, traduntur, in *Prop. 44. Princip.*

Quoniam vis Centripeta tendens ad punctum S, qua urgente corpus in curva moveri potest, est semper ut

$\frac{S \dot{P}}{SP^2 \times S \dot{A}}$; hinc ex data lege vis Centripetæ, Inveniri potest

potest relatio SA ad SP , ac proinde per methodum Tangentium Inversam, exhiberi potest Curva quæ data vi Centripeta describi possit.

Sit verbi gratia vis reciproce ut distantie Dignitas

qualibet m , hoc est, sit $\frac{SP}{SP^2 \times SA} = \frac{b}{a^2 SA^m}$, erit $\frac{SP}{SP^2}$

$= \frac{b SA}{a^2 SA^m}$, & capiendo harum fluxionum fluentes; erit

$\frac{1}{2} SP^{-2} = b SA^{1-m} \frac{1}{a^2}$, unde erit $\frac{\frac{m-1}{2} \times a^2}{b SA^{1-m} \frac{1}{a^2}} =$

SP^2 , & multiplicando tam numeratorem, quam denominatorem fractionis, per SA^{m-1} ; & loco $\frac{m-1}{2} a^2$ ponendo d^2 , fit

$\frac{d^2 SA^{m-1}}{b + e SA^{m-1}} = SP^2$; quare erit $SP =$

$$d \sqrt{\frac{SA^{m-1}}{b + e SA^{m-1}}}$$

Quod si quantitas constans e sit nihilo æqualis erit $SP =$
 $\sqrt{\frac{SA^{m-1}}{b}}$.

Adeoquæ si vis reciproce ut distantie quadratum, poni potest $SP = \frac{\sqrt{d^2 SA}}{\sqrt{b}}$, & curva erit parabola cujus

latus rectum est $\frac{4d^2}{b}$, vel potest esse $SP = d \times \frac{\sqrt{SA}}{\sqrt{b - SA}}$,

& curva erit Ellipsis vel denique potest esse $SP = d \times$

$\frac{\sqrt{SA}}{\sqrt{b \times SA}}$, & curva evadit Hyperbola.

Si vis sit reciproce ut distantia cubus supponi potest, ut $S \dot{P}$ sit $= \frac{dSA}{b}$, & curva fit spiralis Nautica, vel fie-

ri potest ut sit $SP = \frac{dSA}{\sqrt{b - eSA}}$, & Curva erit eadem cum ea cujus constructionem à sectore hyperbolæ petit

Dominus Newtonus; vel potest esse $SP = \frac{dSA}{\sqrt{b + eSA^2}}$,

& ejus Curvæ constructionem per Sectores Ellipticos tradit idem Newtonus, *Cor. 3. Prop. 1. lib. 1. Princip*

Si vis centripeta sit reciproce ut distantia; ratio inter SA & SP , æquatione Algebraica definiri nequit, Curva tamen per Logarithmicam vel per quadraturam Hyper-

bolæ construitur, fit enim $SP = \frac{d}{\sqrt{b - LSA}}$, ubi LSA designat Logarithmum ipsius SA .

Hæc omnia sequuntur ex celebratissimâ nunc dierum Fluxionum Arithmeticâ, quam sine omni dubio Primus Invenit Dominus Newtonus, ut cui libet ejus Epistolas à Wallisio editas legenti, facile constabit, eadem tamen Arithmetica postea mutatis nomine & notationis-modo; à Domino Leibnitio in Actis Eruditorum edita est.

Moveatur jam corpus in Curva QAO , vide *fig. 1.* urgente vi centripeta tendente ad S ; & Celeritas corporis in A dicatur C ; celeritas autem qua corpus urgente eadem vi centripeta, in eadem distantia, in circulo moveri potest, dicatur c . Constat ex Theoremate primo, quod si SA exponat vim Centripetam tendentem ad S ; vis Centripeta tendens ad R , qua urgente, corpus cum celeritate C , circulum cujus radius est AR describet; per SP exponetur. Corporum autem circulos-describentium, vires Centripetæ sunt ut velocitatum quadrata ad circulorum radios applicata, quare erit $SP : SA :: C$

$$\frac{C^2}{AR} : \frac{c^2}{SA}, \text{ unde erit } SP \times AR : SA^2 :: C^2 : c^2 \& C : c :: \sqrt{SP \times AR} : SA.$$

Si SP cum SA coincidat, ut fit in figurarum verticibus erit $C : c :: \sqrt{AR} : \sqrt{SA}$. Quod si curva fit Sectio Conica AR , radius curvaturæ in ejus vertice est æqualis dimidio lateris recti $= \frac{1}{2} L$, ac proinde erit velocitas corporis in vertice Sectionis, ad velocitatem corporis in eadem distantia circuli describentis, in dimidiata ratione lateris recti, ad distantiam illam duplicatam.

Quoniam est $AR = \frac{SA \times S\dot{A}}{SP}$, erit $C^2 : c^2 ::$
 $\frac{SP \times SA \times S\dot{A}}{SP} : SA^2 :: \frac{SP \times S\dot{A}}{SP} : SA :: SP \times S\dot{A} : SA \times SP$, adeoque ex data relatione SP ad SA , dabitur ratio C ad c , Exempli Gratia. Si vis fit reciproce ut distantie dignatas m , hoc est fit $\frac{SP}{SP^2 \times S\dot{A}} = \frac{b}{a^2 SA^m}$;
 & erit $SP = \frac{b SP^2 \times S\dot{A}}{a^2 SA^m}$, adeoque erit $C^2 : c^2 ::$
 $SP \times S\dot{A} : \frac{b SP^2 \times SA \times S\dot{A}}{a^2 SA^m} :: a^2 SA^{m-1} : b SP^2$.
 Unde si ponatur $SP^2 = \frac{a^2 SA^{m-1}}{b} = \frac{m-1}{2} \frac{a^2 SA^{m-1}}{b}$,
 erit $C^2 : c^2 :: a^2 SA^{m-1} : \frac{m-1}{2} a^2 SA^{m-1} :: m-1 : 2$
 ac proinde erit $C : c :: \sqrt{\frac{m-1}{2}} : \sqrt{\frac{2}{m-1}}$.

Quod si ponatur $SP^2 = \frac{a^2 SA^{m-1}}{b-e SA^{m-1}} = \frac{m-1}{2} \frac{a^2 SA^{m-1}}{b-e SA^{m-1}}$

fiet C^2 ad c^2 , ut $a^2 SA^{m-1}$ ad $\frac{m-1}{2} \frac{a^2 b SA^{m-1}}{b-e SA^{m-1}}$, hoc est

ut

ut $b = e S A^{m-1}$ ad $\frac{m-1}{2} b$, sed est ratio $b = e S A^{m-1}$,
ad $\frac{m-1}{2} \times b$, minor ratione b ad $\frac{m-1}{2} b$, seu ratione 2 ad
 $m-1$, unde erit C ad c in minore ratione quam est
 $\sqrt{2}$ ad $\sqrt{m-1}$.

Similiter, si capiatur $SP = \frac{d_2 S A^{m-1}}{b+e S A^{m-1}}$, inveniatur ef-
fe C ad c in maiore ratione quam est $\sqrt{2}$ ad $\sqrt{m-1}$.

Cor. Si corpus in Parabola moveatur, & vis Centri-
peta tendat ad focus S, erit velocitas corporis, ad
velocitatem corporis in eadem distantia, circulum de scri-
bentis ubique ut $\sqrt{2}$ ad 1, nam in eo casu est $m = 2$ &
 $m-1 = 1$. Velocitas corporis in Ellipsi est ad veloci-
tatem corporis, in circulo ad eandem distantiam moti, in
minore ratione quam $\sqrt{2}$ ad 1. Velocitas in Hyperbola
est ad velocitatem in circulo in maiore ratione, quam $\sqrt{2}$
ad 1.

Si Corpus in Spirali Nautica deferatur, est eius veloci-
tas ubique æqualis velocitati corporis in eadem distantia
circulum deferibentis nam in eo casu est $m = 3$ & $m-1$
 $= 2$.

III. *An Extract of Two Letters from the Missionary Jesuits, concerning the Discovery of the New Philippine-Islands, with a Map of the same.*

L E T T E R I.

From Father Paul Clain of the Society of Jesus, to the Reverend Father Thyrsis Gonzalez, General of that Society.

Manila, June 10, 1697.

AFTER the Ship had sailed, that carried the Letters I writ to you last Year, most Reverend Father; there arrived here another, that brought me Orders to accompany the Reverend Father *Antonio Fuccio* of *Sicily*, our new Provincial of this Country. In visiting with him our Religious Houses, I travelled over the Country of the *Pintados*; which are large Islands separated from one another by Arms of the Sea, whose Ebbing and Flowing renders their Navigation very difficult and dangerous.

At the Town of *Guivam* in the Isle of *Samal*, the last and most Southern Island of the Eastern *Pintados*, we found twenty nine *Palaos*, or Inhabitants of certain new-discover'd Islands. The Easterly Winds, that blow on these Seas from *December* to *May*, had driven them three hundred Leagues from their own Islands, to this Town of the Isle of *Samal*, where they arrived in two small Vessels, called *Paraos*: Of which we received this following Account.

They embarked, to the number of thirty five Persons, to pass over to one of the Neighbouring Islands; when there arose a very strong Wind, that forced them out into the Main Sea, so that they could not gain the Island they design'd for, nor any of the Neighbouring ones. After having made several Attempts to get ashore on some Island within their knowledge, but in vain, they were driven before the Wind for seventy days together, without being able to make any Land. At last, out of all hopes of returning to their own Country, and half dead for want of Water and Provisions, they resolv'd to give themselves up to the mercy of the Winds, and Land at the first Island Westerly that they should come to. They had no sooner taken this Resolution, but they found themselves in sight of the Town of *Guivamo* in the Isle of *Sanal*. A *Guivamois* that was then on shoar, perceiving them, and judging by the Make and Smallness of their Vessels, that they were Strangers, and out of their way, took a piece of Cloath, and made them a Signal of entering the Road he directed, to avoid the Shoals and Banks of Sand, they would otherwise run upon. These poor People were so frighted at the sight of this Stranger, that they began to put out again to Sea; but notwithstanding all their Endeavours, the Wind forced them back a second time towards the Shoar. When they were near, the *Guivamois* again made the Signal as before; but seeing they did not mind it, but would unavoidably be lost, he threw himself into the Sea, and swam to one of their little Vessels, on purpose, to bring them safe in to shoar. He was no sooner got to them, but the Women with their Children at their Backs, and all that were in the Vessel, threw themselves over-board and swam to the other: He, seeing himself alone in the Vessel, resolv'd to follow them, and getting aboard the second, shew'd them how to avoid the shoals, and

and brought them safe to Land. In the mean time they stood immoveable, and resign'd themselves up entirely to the Conduct of this Stranger, as so many Prisoners.

They landed on St. *Innocent's* Day, the 28th of *December* 1696. The Inhabitants of *Guirum*, running to the Shoar, received them very kindly, and brought them Wine and other Refreshments. They eat *Coco's* very freely, which are the Fruit of the Palm-Trees of this Country: The Pulp of them is somewhat like that of Chesnuts, except that it is more oily, and furnishes them with a sort of sweet Water, very pleasant to drink. They gave them Rice boyled in Water, which is eat here and all over *Asia*, as Bread is in *Europe*. They looked on it with Surprize; and taking some Grains of it, threw it on the Ground, imagining it to be Worms. They rejoyce if one brings them great Roots, call'd *Palavan*, which they eat greedily.

In the mean time they brought to them two Women, that had formerly been driven on shoar on the Coast of *Guirum*; who knowing a little the Language of this Country, it was by their means they learnt what I shall hereafter relate. One of these Women found among those Strangers, one of her Relations, who as soon as they knew one another, fell a weeping. The Father, who has on him the Care of this Town, having heard of the Arrival of these People, sent for them to *Guirum*. As soon as they saw him, and what Respect was paid him, imagining that he was the King of the Country, and that their Lives were in his Hands, they threw themselves on the Ground, to ask his Pardon, and beg their Lives. The Father moved with pity to see them so disconsolate, did all he could to comfort them; he caressed their Children, three of which still suck'd, and five others were somewhat older; and promised their Parents to give them all the assistance in his Power.

The Inhabitants of *Guivam* strove one with another, who should entertain these Strangers at their Houses, and furnish them with Provisions and Cloaths, and whatsoever else should be necessary ; which the Father granted them, on condition they did not separate those that were Married, or take less than two of them together, for fear any should die of Grief if left alone. Of thirty five Persons that embarked, there remained but thirty ; five dying thro' want of Provisions and other Hardships in so long a Voyage ; and some time after their Arrival here, died another.

They relate that their Country consists of two and thirty Islands ; which cannot be far distant from the *Marianas*, as may be judged by the make and smallness of their Vessels, and Form of their Sails, which are very like those of the *Marianois*. It is likely these Islands may be eleven or twelve Degrees of Northern Latitude, more Southern than the *Marianas*, and under the same Degree of Longitude as *Guivam* ; for sailing directly from East to West, they came ashore at this Town. It is also probable, that it was one of these Islands that was discovered some Years ago at a distance, when a Ship belonging to the *Philippines*, leaving the common Road, which is from East to West under the third Degree of Longitude, and running further to the South East, first perceived it. Some called this Island *Carolina*, from *Charles II.* King of *Spain* ; and others the Island of *St. Barnaby*, because discovered on the Day that the Church celebrates the Feast of that Apostle. It was again seen last Year, by another Vessel that a Storm had driven out of its Road, in going from hence to the *Marianas*. The Governor of the *Philippines* has often given Orders to a Vessel, that goes almost yearly to the *Marianas*, to look for this and other Islands that they suspected to be hereabouts ; but these Orders were ineffectual, God preserving

serving to this time the Discovery of them, and (as we hope also) the intire Conversion of these People.

These Strangers add, that of these two and thirty Islands, there are three of 'em that are uninhabited, unless it be with Wild Fowls; but the others are very well Peopled. If one asks them the Number of Inhabitants, they point to a heap of Sand, to shew that their Number is infinite. The Names of these Islands are *Pais, Lamululutap, Saraon, Taropie, Valayay, Satavan, Cutic, Tjalcu, Piraulop, Ttai, Pic, Piga, Lamurrec, Puc, Falast, Caravavong, Tlatu, Lamuliur, Tavas, Saypen, Tacaulap, Rapiyang, Tavon, Mutacusan, Piyla, Olatan, Palu, Cucun, &c. Pijalacunung*. The three that have nothing on them but Wild Fowls, are *Piculat, Hulatan, Tagian*. *Lamurrec* is the most considerable of all these Islands: It is there that the King of the Country keeps his Court; the Governors of all the other Islands are subject to him. Among these Strangers there is one of these Governors, and his Wife, who is the King's Daughter. Tho' they go half naked, yet their Carriage, and a peculiar Air of Greatness, sufficiently distinguishes them from the rest. The Husband has his Body painted all over with certain Lines, in such manner that they form several Figures: The rest of the Men are also painted in like manner, more or less. The Women and Children are not painted at all. There are nineteen Men of them, and ten Women, of different Ages. The Make and Colour of their Face is much like that of the *Philippinots*: The Men have no other Cloaths, than a sort of Sash, several times wrapt about their Body, that covers their Reins and Thighs. They wear upon their Shoulders above an Ell and half of course Linen Cloath, like a Cowl, tied before, and hanging loose behind. Both Men and Women are dressed much alike, except that the Women have a piece of Cloath somewhat longer, that hangs from their Waste down to their Knees.

Their.

Their Language is different from that of the *Fijians* and *Marianas* : Their Manner of pronouncing it comes nearest that of the *Arabs*, as some who understand that Language have observed. The Woman, that seems the most considerable amongst them, has several Rings and Necklaces of Tortoise-shell, (call'd here *Caray*) and others made of a Substance yet unknown to us, much resembling Ambergrise, but not transparent.

The Manner of their living at Sea, which was for seventy days together, continually driven by the Wind, was thus : They cast out a sort of Net, made of a great number of little Twigs of Trees tied together, having a large Mouth for the Fish to enter in at, and ending in a Point to prevent their getting out again. The Fish they took after this manner, was all the Nourishment they had, and Rain-water saved in Coco-shells, which is the Fruit of the Palm-tree (as observed before) of the Figure and Size of a Human Skull.

They have no Cows in their Islands : As soon as they saw them, they ran away, as they did likewise at the Barking of a Dog, in one of the Missionaries Houses. Neither have they Cats, Stags, Horses, or in general any Quadruped. Nor any Fowls but Sea-Fowls ; excepting Hens, which they breed up, but never eat their Eggs.

Notwithstanding this their want of every thing, they are very merry and contented with their Condition. Their Songs and Dances are exact and regular : When they Sing, it is altogether, every one observing the same Humour and Gestures, which makes it very agreeable.

They are surprized at the Government, Politeness, and Manners of the *Europeans*, of whom they had not the least knowledge. They admire not only the Solemnities and Ceremonies of the Church in celebrating Divine Service ; but also the Musick, Instruments, Dances

of the *Spaniards*, and their Arms; but *Carpenter* what raises in them the greatest Admiration. They wonder at the Whiteness of the *Europeans*, in respect of whom they are perfectly Tawny, as well as the Inhabitants of this Country.

It does not yet appear, that they have either any Knowledge of a Deity, or that they worship Idols. Their Life is perfectly Savage, taking care of nothing but Eating and Drinking, in which they observe no set time, but eat and drink at any time or place, when hungry or thirsty, or they can find any thing to satisfy themselves; yet they eat but little at a time, and never enough to suffice for a whole day. They show a great Respect and Deference for their King, and Governors of their Towns, and obey them very precisely.

Their Civility and Respect consists in taking hold of the Hand or Foot of the Person they honour, and rubbing gently his Face. They have among their Utensils some Saws, not made of Iron, but of a large Shell, called here *Taclobo*, rubbed and sharpen'd upon a certain kind of Stone. They were surprized at a Merchant Ship that was building at *Guiram*, to see the number of Carpenters Tools that were used about it: They viewed them all, one after another, with a great deal of admiration. They have no Metals in their Country. The *Father Missionary* made each of them a Present of a large Piece of Iron, which they received with as much Joy, as if it had been so much Gold; and are so afraid it should be stole from them, that they lay it under their Heads when they go to sleep. They have no other Arms but Lances or Darts, made of Human Bones very well sharpen'd and fix'd on. They are very peaceful of themselves; but if any Quarrel happens among them, it is decided with some Blows on the Head with the Fist, which yet very rarely happens; for when they would come to a close Fight, they separate them, and they are soon reconciled

ciled again. They are not dull and heavy, but on the contrary, have a great deal of Liveliness and Courage. They are not so lusty as the Inhabitants of the *Marianas*, but nevertheless are well proportioned, and of a Shape much like those of the *Philippines*. Both Men and Women let their Hair grow long, and hang loose on their Shoulders.

When they understood they were to be conducted to the Presence of the Father Missionary, they painted their Bodies all over with a Yellow Colour, which is look'd upon by them as a great Beauty. They are so well satisfied with finding here plenty of of every thing that is necessary for Life, that they offer'd to return home, and bring with them their Countrymen to enter into a Commerce with these Islands : Which design our Governor liked very well, in hopes thereby to gain this Country to the King of *Spain*. The Oldest of these Strangers was once before cast on the Coast of *Caragan*, in one of our Islands ; but finding there none but Infidels, that lived in the Mountains and Desarts, he returned home again, without knowing any thing of the Plenty and Riches of these Islands. They are very expert at Diving ; and they say, they lately, in Fishing, took two large Pearls in their Shells, but threw them into the Sea again, not knowing the Value of them.

LETTER II.

From Father Le Gôbien, to the Jesuites of France.

Reverend Fathers,

I Here send you, as I promised, a Map of the new *Philippines* ; which is one of the most Extraordinary Discoveries that has been made in these last Ages. It is strange that these Islands, being situate between the *Molucco's*,

Iacoo's, the old *Philippines*, and the *Marianas*, which have been known near these two hundred Years, should remain undiscover'd 'till now. They are eighty seven in number, and make one of the finest *Archipelago's* in the East; being inclos'd on the North and South between the Line and the Tropick of *Cancer*, and on the East and West between the *Marianas* and *Philippines*.

I shall not detain you here, in relating the Largeness of these New Islands, their Distances one from another, or their Order and Situation; all which may be easily seen in the Map.

It has elsewhere been shown how this New Country came first to be discover'd, [*viz.* in the former Letter;] so that I shall only relate here, what ought to be rectified therein, according to our last Advices received from thence.

The Map I here send you, was not made by *Europeans*, for none have yet been upon these Islands, but by the Islanders themselves, after this manner. Some of the most skilful of 'em ranged upon a Table as many little Stones as there are Islands belonging to their Country; and marked out, as well as they could, the Name of each, its Extent and Distance from the others: And this is the Map, thus traced out by the *Indians*, that is here ingraved. Not that I can warrant the exactness of it, not doubting, but that when our Missionaries shall have travell'd over these Islands, and got a more perfect Knowledge of them, there will be found a great many things in it that will need Correction.

The Natives of these Islands never offer any Violence to one another: Murder and Homicide are unknown to them; and they have a Proverb among them, That *one Man never kills another*. It is probable these Islands may abound in Gold, Amber and Drugs; being situate nearly under the same Degree of Longitude as the *Mo-*

luccos, from whence we have Nutmegs, and other valuable Spices.

Tho' these People seem barbarous to us, yet they have among themselves a sort of Politeness and regular Government. Every Island obeys its Chief, who himself is subject to the King of the Country. This Prince holds his Court in the Island of *Fabu*, called likewise *Lamunies*; which multiplicity of Names seems to be the reason why we cannot find in this Map scarce any of the Names mentioned in Father *Clain's* Letter; or perhaps because at first from the Natives pronounciation of the Names of their Islands, they were written by the *Spaniards* after a different manner from what they are at present.

Tho' these Islands were never heard of in *Europe*, 'till within these five or six Years, yet 'tis a long time since, from the High Mountains of *Samal* they have discover'd thick Smoaks on that Coast; which commonly happens in Summer time, when these Islanders set fire to their Woods and Forests to clear up the Ground. These Smoaks, which the Fishermen of *Mindanao* and other Islands, have also observed when far out at Sea, have made them conjecture, that there was Land East of the *Philippines*; but they never had any certain knowledge of it, till some time before the abovementioned Arrival of these Islanders at *Samal*: Which happened thus.

The King's Brother of these new *Philippines*, in a Sea Voyage, was driven on the Coast of *Caragan*, in the great Island of *Mindanao*. The *Spanish* Fathers, who have a very fine Mission there, received this Prince with a great deal of Honour and Friendship, and instructed him in the *Christian* Religion; which he was so well pleas'd with, that he never thought of returning again to his own Country. In the mean time the King, dissatisfy'd at the Loss of his Brother, fitted out a Fleet of an hundred small Vessels, which he sent to every Island under

under his Dominion, to see if they could learn any News of him. One of these little Vessels was forced by a Storm on the Coast of *Caragan*, at the same place as the King's Brother was before. Where landing, they immediately knew him, and with Tears told him the occasion of their Journey, the Discontent of the King his Brother, and desired him to return back with them. The Prince thanked them for the trouble they had been at, and desired them to satisfy the King, that he was well and contented, but could not, by any means, be persuaded to return home again.

Explanation of the Map.

The Figure in the midst of every Island, shows how many days sail it is in Circumference.

The Figure between each Island, shews how many days are required to pass from one to the other.

As for Instance. The Figure 30, in the Isle of Panlog, shews that it is 30 days in Circumference; and the Figure 3, between the Cape of Guivam and the Isle of Panlog, shews, that it is three days passage to it.

The Indians, who were the occasion of those Islands being discovered, embarked in the Island Amorlot, marked in the Map by the Letter C, with a design to pass to the Isle of Paiz, marked by the Letter B; but were driven by a Storm out to Sea, and after 70 days Sail, cast on the Cape of Guivam in the Island of Samal, called by the Spaniards, Ibabao.

A, the largest of these Islands, named Panlog.

D, the Isle of Falu, or Lamuirec, where the King holds his Court.

IV. *A Relation of the New Island thrown up near the Island of Santerini ; sent to the Marquis of Ferriol, Ambassador Extraordinary of France at the Ottoman Port. Taken from the Memoirs of the History of Arts and Sciences at Trevoux, for the Month of July, 1708.*

My Lord, .

THIS new *Phænomenon*, that has appear'd in our part of the World, seems to us so extraordinary and Curious, that I am perswaded, a True and Particular Relation of it will be very acceptable to your Excellency ; in which I shall do my self the Honour to write at large, whatsoever I judg'd most remarkable and deserving your Notice.

On Monday the 23d of May, 1707, at Sun-rising, we observed between the two *Burnt Islands*, commonly called the *Little* and *Great Cameny*, as it were a Floating Rock ; which we thought at first had been some Vessel Shipwrack'd on that Coast, and seem'd as if it would in a little time be dash'd to pieces against the *Lesser Cameny*, that was hard by : On which account some Mariners, in hopes of Booty, put out immediately to see what it was. Soon after we were amazed to hear by 'em, that it was a Shoal which began to spring up from the Bottom of the Sea ; and was not as yet very plainly to be discerned. Next day (the 24th) several Persons, both Ecclesiasticks and Seculars, went out of Curiosity

to satisfy themselves, not easily believing what the Mariners related : But they were no sooner got to the place, than their Eyes fully convinced them, that it was Matter of Fact. Some of 'em were so bold as to get a-shoar on this new Shoal, which was still moving, and sensibly increased under their Feet. They brought us back several Curiosities, and among others a kind of Oysters, very large, and of an Exquisite Taste, which they found sticking to the Rock, and raised out of the Water, as the Shoal had increased in height. Above all I observed a sort of Stone, that at first sight look'd much like Bisket, but in reality was nothing but a very fine Pumice-stone, surpassing all that I ever saw in *France*, or any other Parts of *Europe*.

Two days before the springing up of this Shoal, on the 21st, between twelve and one at Noon, there was an Earthquake over the whole Island ; which we cannot reasonably attribute to any other Cause than the rising up of this Mass of Rock : And this was the only Trouble and Fear that this New Island gave us ; for from its first appearance to the 13th or 14th. of *June*, it has continually increased very sensibly, as well in bigness as height, without any noise, or giving any other disturbance or concern to any Body, than the uncertainty and expectation of what would be the Consequences of it.

This Shoal is very pleasant to look on, of a white Colour, and round Figure. The Earth that it is composed of is light, with a small Mixture of Clay. Perhaps I should be thought too extravagant, if I should affirm this New Island, according to the Report of some Learned and Skilful Persons that were upon it in the beginning of *June*, to be half a Mile in Circumference, and from 20 to 25 Foot high. Its increasing for 4 or 5 days, was not so sensible as before ; infomuch that most were perswaded, that it had intirely ceased : Every Body

dy then thought themselves safe, and that there was nothing further to be fear'd; but they were afterwards convinced of the contrary. For the Sea, already much troubled by the raising up of this Mass of Earth, appeared more troubled every day than other; not so much by reason of this Shoal lately removed, and still floating, as on account of the Mixture of a vast Quantity of different Matters, continually thrown up Night and Day from the Bottom of the Sea; so that one might easily distinguish several sorts of Minerals, by the diversity of Colours they made on the Surface of the Water; but Sulphur was in greatest abundance, insomuch that the Sea was colour'd with it about *Santerini*, to near 20 Miles distance. The excessive rolling of the Waves about the new Shoal was greater than ever; and a more than ordinary heat was sensible to any one that approach'd too near, which undoubtedly was the Cause of such Quantities of Fish being found dead on the Shoar. Every Body perceived a horrible Stench, that infected the Neighbouring Air; and which we our selves, tho' more than 3 Miles distant, often found of dangerous consequence. The boiling of the Waters, which some before doubted of, proved now too true; and instead of decreasing, grew every day considerably greater. This struck all People with a fresh fear; and changed the Resolutions of those, who were so bold before as to venture on this New Island, more out of Diversion, than any commendable Curiosity. But their fear was increased, when on *Friday July 16th at Sun-set*, they perceived between this new Island and the *Lesser Cameny*, as it were a Chain of Black Rocks, that rose up from a prodigious depth of the Sea, to the Number of 17 or 18, not very distinct from one another, but seem'd as if they would shortly unite together, and joyn themselves to this new Island, as they actually did some few days after. Next day,

day, being *Saturday*, we saw them plainer; and those whose Tops we could only see the Night before, now appeared extraordinary large. On *Sunday* we first perceived Smoak to break forth, much resembling, in thickness and colour, that of a burning Furnace; and at the same time heard certain Murmurings under Ground, which seemed to proceed from the Center of this New Island, as yet too deep in the Sea, to be plainly distinguished.

Every Body then of both Sexes were more frightened than ever, and thought of nothing, but how they should shelter themselves from the approaching Danger, and avoid the Fire that they foresaw in all likelihood would soon follow. Whole Families went for refuge to the neighbouring Islands; and others contented themselves only with changing their Habitations, and living in the open Country, thinking themselves safer there. In the mean time the Rocks abovementioned united together, and seemed already to form another Island distinct from the former. The Smoke appeared in greater abundance; and the Fire, which we so much dreaded, at last began to break forth about the 19th of *July*: It was so little at first, and of so dull a colour, that few believed it to be really so; but afterwards increasing by degrees as the Island increased, and breaking out more and more, and in different Places, all were sufficiently convinced of it.

It was no less frightful and amazing than curious, to see every Night on the top of this Mount, that Nature had lately formed, a vast number, as it were, of burning Furnaces, all of a bright Flame; in order and position not unlike those Illuminations of the *Minarets*, which the *Turks* usually make at certain times every Year. One Night at the end of *July*, about an Hour after Sun-set, as we were observing the different *Phænomena* of this New Island, there appear'd of a sudden, in the middle

Regi-

Region of the Sky, a fiery Lance, seeming to come from East to West; but it disappearing again to soon, we could not exactly observe the dimensions of it. In the mean time the Burnt Island increased prodigiously, and extended it self principally on the South and North sides. The Sea also seemed much more disturbed and loaded with Sulphur and Vitriol. The boiling of the Water was more fierce and violent: The Smoak thicker, and in greater abundance; and the Fire bigger and more frightful. But above all, a Stench that infected the whole Countrey, grew so insupportable, that Persons of the strongest Constitutions could scarce breath in it; others, that were weaker, fell into frequent Faintings; and almost every Body was seized with Vomiting. I could not then but imagine my self on Board some Man of War, where at a general Discharge of all the Guns, the confused stink of the Powder, Tar, and stench of the Ship, especially in foul Weather, often overcomes the strongest Seamen. Just such a nauseous stink we were forced to breath in, without being able any ways to avoid it, or defend our selves from it. But as we were infected with it but at times, and as the Wind brought it; so it was sometimes more in one place than another, and more or less tolerable, as the Wind sate. This ill Scent was very mischievous: It spoiled most of the Vines; and a great Smoak, that rose out of the midst of this New Island like a Mountain, joyning it self to a thick Fog, that commonly hangs over *Santerini* when the Wind is at South, burnt and destroy'd, in the beginning of *August*, in less than three hours time, all the Fruit that was ripe, and ready to be gathered; especially in such Vineyards, as lay most exposed to the South. A few days after I was obliged to go to *Naxos*, so that I was absent 13 or 14 days; in which short space of time there was so great an Alteration in these two New Islands, that I scarce

scarce knew 'em again at my return ; so different they were from what I left them. The White one, that did not seem to increase any more, was now grown considerably higher ; and the Black one was much longer. Both of them, tho' different in colour, were now united together, and made but one Island, as they remain at this time. The Fire and Smoak had made new Vent-holes ; and the noise under Ground was more frequent and audible. They told me, that in my absence they heard from the midst of the Island, as it were, so many large Cannon shot off, and at the same instant saw a great quantity of Burning Stones thrown into the Air. I could scarce believe it at first, and tho' I did not look on it as altogether improbable, yet I could not persuade my self but that they had much exceeded the truth. But a few days after I was my self an Eye-Witness of so Prodigious and Frightful a Spectacle. I watched Day and Night these furious Discharges, which made the Doors and Windows of our Chambers shake, and sometimes the very best built Houses : And saw with my own Eyes, more than once, Stones all on Fire darted into the Air out of sight, and after fall again like a Bomb, and quench'd in the Sea at more than five Miles distance.

When these Discharges happen'd, which were as loud as those of a Cannon, we commonly saw immediately a great Flash of Fire like Lightning ; and after that, there sprung up very swiftly, a black and dismal Smoak, mixt with Ashes, and so prodigiously thick, that when spread in the Air, it made a thick Cloud of several Colours ; which, by degrees, dissolving it self in a fine Dust, fell like Rain on all the Neighbouring Country, and more particularly on our Island, where it was in such abundance, that the Ground was often covered with it. The Noise grew stronger, and was louder

F f

than

than if six or seven Cannons had been discharged together: The Fire made it self every Day more Vent-holes, and became more dreadful. We commonly sat up the greatest part of the Night to observe it.

Every Night Nature represented as great variety of Scenes, as the Fire broke forth in different Forms; sometimes burning Ashes spread themselves in the Air, like a Plume of Feathers, which falling again on the Shoal, made it appear as if of a light Fire. Other times one would think it was actually the discharging of so many Mortar-pieces, which threw intire Rocks, like so many Bombs, capable of destroying the largest Ships; tho' for the most part, these Stones were of a middle size, but in such Quantities, that I often saw this little Island all cover'd with them, and so pleasantly illuminated, that one would never be weary of looking on it.

These dreadful Discharges were less frequent at the end of *August*, but increased in *September*, were daily in *October*, and at this time are almost incessantly. 'Tis true, the Noise is not so loud; the Stones, that are cast up, are not so big nor so many; the Boiling and Disorder of the Water is much abated; the Sea begins to recover its former Colour; the Stench, that was before insupportable, has been very little for these six Weeks. Yet the Smoak grows every day thicker, blacker, and in greater abundance: The Fire is more than ever, and seems sometimes to strike the very Sky: The Subterraneous Noise is continual, and so violent, that it can't be distinguish'd from Thunder: Dust and Ashes fall daily on this our Island. The Countryman is dejected at the Loss of his Corn, which scarce sprung out of the Ground, begins to fade already: And the Mariner, not so bold as before,

content

contents himſelf with viewing it at a diſtance, ſore the loſs of a Bark of this Country, which going too near, took Fire and was burnt.

In a word, our New Iſland grows every Day more Curious, more Dreadful, and leſs Acceſſible: And is ſo far from ceasing to increaſe, at the Approach of Winter, as ſome Pretenders to Philoſophy would perſwade us, that we ſee it continually increaſing on the South Weſt ſide; where Nature ſeems as if ſhe labour'd to make a large Port, capable of holding all manner of Ships, which may one Day render *Santapana* not ſo practicable as heretofore.

This, my Lord, is in ſubſtance what I thought moſt remarkable, in relation to this New Iſland, from the firſt beginning of it, to this 20th of *November*. I leave our Philoſophers and Curious Men, to reaſon on it as they ſhall think fit; and our Geometricians to condemn me for ſaying nothing of its Dimenſions. I had rather be blamed by them, than expoſe my ſelf to a juſt Cenſure, in ſpeaking bundly of what I know nothing of, and which it is, as yet, impoſſible to be truly informed in. But if I may be permitted to give my Judgment, barely from Appearance, and the Common Opinion of People here, I think I ſhould not exceed the Truth, if I affirm this New Shoal to be at preſent at leaſt three Miles in Circumference, and more than from thirty five to forty Foot high. I hope in time, as this Iſland becomes eaſier of Acceſs, we ſhall then find means to ſpeak more particularly of it, and of giving your Excellency a more faithful and exact Relation.

I shall then do it with the same Pleasure, as I am at present, and shall always be, *My Lord*, with the greatest Respect,

Your Excellency's

most Humble

and most Obedient Servant,

Bourguignon.

E R R A T A.

Philosoph. Transact. Numb. 316. p. 125. l. 12. and p. 137. l. 14. for Capt. *Wine* read Capt. *Winde*.

L O N D O N,
Printed for *H. Clements* at the *Half-Moon* in *St. Paul's*
Church-yard. MDCCIX.

A PASSAGE BY LAND TO CALIFORNIA

*Discovered by the Rev Father
Eusebius Francis Kino Jesuite
between y^e years 1698 and 1701*



PHILOSOPHICAL TRANSACTIONS.

For the Months of November and December, 1708.

The CONTENTS.

- I. *A Letter from Mr. Anthony van Leeuwenhoek, F.R.S. containing his Observations upon the White Matter on the Tongues of Feverish Persons, &c.*
- II. *A Letter concerning a Colliery that took Fire, and was blown up near Newcastle, killing 69 Persons, on August 18, 1708. Communicated by the Reverend Dr. Arthur Charlett, Master of Univerſity College in Oxford.*
- III. *An Account of the Succeſs of an Attempt to continue ſe-
veral Atmospheres of Air condens'd in the ſpace of one, for
a conſiderable time. By Mr. Fr. Hauksbee, F. R. S.*
- IV. *An Account of an Experiment touching the Production
of Light within a Globe Glaſs, whoſe inward Surface is
lin'd with Sealing-Wax, upon an Attrition of its outſide.
By Mr. Fr. Hauksbee, F. R. S.*
- V. *An Account of ſeveral Experiments, in relation to the
Weight of Common Water, under ſeveral Circumſtances.
By Mr. Fr. Hauksbee, F. R. S.*
- VI. *An Account of the ſcurvy, and of the Cure of the
ſcurvy, by Mr. Poupart. Taken from the Memoirs of the Hiſtory
of the Academy of Sciences.*
- VII. *An Extract of a Memoir, concerning the Diſcovery of
a Paſſage by Land to California, with a Map, and Deſcrip-
tion of the Country. Taken from the Letters of Fr. de Guad-
dalaxara in Mexico, by Fr. de Guadalupe, taken from
the Letters of the Miſſionary, &c.*
- VIII. *De Variis Aſſectibus, quibus ſubſiſcit, &c. &c.
Geo. Joſ. Camerarius.*

Now when I had again observ'd with the greatest caution those Particles, which I had divided as well as I could from one another, and view'd them thro' one of my best Microscopes, I observed lying, and also floating in the liquid Substance, an unspeakable Number of long Particles, which were very bright and exceeding slender; some of them were much longer than others, and the longest of all agreed in length with the Hair of a Man's Beard, who had not been shaved in eight or ten days; some of them also appeared a little crooked.

Now whereas in my former Observations, I did not discover the aforesaid long Particles, it might perhaps proceed from hence, that I did not then so nicely attend unto it; for having now again looked over little of that Matter which I had scraped from my Tongue in my former Sickneſs, and which lay by me on a Glass, I judg'd that Matter likewise was composed of Particles.

I believe likewise, that in my endeavouring to separate those Particles from one another, I broke a great many of 'em to pieces.

I was likewise considering whether or no these long Particles might not be that Matter that is separated from the Blood, and which we call the Serum or Whey of the Blood; but if it be so, how can one conceive that such Matter should boil half an hour long in Water, and remain in the same several Days, without being dissolved or separated.

Some People, perhaps, might be ready to think, that hereafter bright Particles might be produced by some Medicine or other, that I had made use of, but that would be a mistake; for during my Fever, I did not take the least Physick, or indeed any thing else but a little Caudle, or a little Veal Broth with some Bread in it.

Now

Now since we perceive that that Matter, which is taken from the Tongue of a diseased Body, is not unit'd but by the slimy Stuff, which is as it were peculiar to our Mouth; and that the said slimy Matter, is as it were dissolv'd by boiling Water. and that the Particles which are protruded out of the Tongue, lie in the Water separate from each other, and that several Days after that we have divided them, tho' it be into Particles no bigger than a Grain of Sand; we should judge that the whole Matter did in a manner only consist of long slender Particles, which I imagine had at first been much longer; but in the endeavouring to separate 'em, were broke into such short Pieces, as they now appear to me. which being so, we ought not to doubt, but that the said Matter is protruded out of the Tongue, and no evaporation or Coagulation from the Intrails.

In time of my Fever I had also a great Cough, in so much that I was often apprehensive, that by the violence thereof I might break some of the Blood Vessels in the Lungs.

I spit some of the Phlegm, which with great Violence I had brought up, into a clean Pewter Pot, into which I had put a very little fair Water aforehand; and perceiving at the bottom of the said Pot, a longish Particle about the thickness of a Pin, but not quite so long, I took it out of the Water, and placed it before a Microscope, and judg'd it to be some coagulated Blood, tho' it was not of a red Colour; for I could see the Globules as plain as ever I discover'd them in the Blood, and one would at first have imagined them to be Blood Vessels with their Branches. but observing them more nicely, I discovered, that that Appearance was only occasioned by some of the Globules of Blood lying in their length something thicker upon the other.

Moreover I observed some brown cloudy Particles, floating very near the bottom of the Water, of which having taken out several, and view'd them by a Microscope, they appeared to my Eye to be mostly Blood Globules. After that that Matter, which I had taken from my Tongue, had lain above a Fortnight in the Water in which it was boyl'd, and that that Water was almost evaporated; I poured a little fresh Rain-water upon them, which had stood in a clean Bottle upon my Desk near the said boyl'd Water: and five or six days afterwards I took a thin slender Glass Tube, one of the Ends of which was open, and turn'd it hastily upside down into the bottom of the *China* Cup, in which most of the Particles which I scrap'd from my Tongue lay; with this design, that by the rushing in of the Water into the Tube, some of those Particles of the Tongue should be likewise carried upwards into the Glass Tube, and that by this means I might have a fresh Opportunity of viewing the said Particles; and it happen'd as I wish'd, and I discovered an unconceivable Number of exceeding small Animalcula, and those of different sorts; but the greatest Number of them were of one and the same Size, but they were so little, that without a careful Observation, and a very good Microscope, they would have escap'd my Sight. Most of these Animalcula rendezvous'd in that part of the Water where the said Matter of my Tongue lay; which made me think whether those Animalcula might not receive their Nourishment from the aforementioned Particles: After these Animalcula had been about two hours in the Glass Tube, I perceived that a great many of 'em were dead.

II. *A Letter concerning a Colliery that took Fire, and was blown up near Newcastle, killing 69 Persons, on August 18, 1708. Communicated to the Reverend Dr. Arthur Charlett, Master of University College in Oxford.*

Chester Le Street, October 2, 1708.

ON *Wednesday* the 18th Day of *August* last, at *Fildesfield*, in the Parish of *Chester Le Street*, about Three of the Clock in the Morning, by the sudden Eruption of a violent Fire, which discharged it self at the Mouths of three Pits, with as great a noise as the firing of Cannon, or the loudest Claps of Thunder, threescore and nine Persons were destroyed in one instant. Three of them, *viz.* two Men and a Woman were blown quite up from the bottom of the Shaft, fifty seven Fathom deep, into the Air, at a considerable Distance from the Mouth of the Pit. One of the Men with his Head almost off, and the Woman with her Bowels hanging about her Heels.

The Engine, by which the Coals were drawn up, and is of a great weight, was removed and cast aside by the force of the Blast; and what is more wonderful, the Fish, which were in the Rivulet, that runs twenty Yards under the Level, and at as a great a distance from the Mouth of one of the Pits, were in great Numbers taken up dead, floating upon the Water, by several of the Inhabitants. Now whether this happen'd by the violent Concussion of the Air, or they were choaked with the Sulphur, that, to be sure, in abundance dispers'd it self abroad, I must leave to you and the Ingenious Gentle-

men of the *Royal Society* to determine ; only I shall tell you, that for several Days a very strong and noisome Smell continued to come out of the Pits.

And that I may give you, Sir, the fullest Account I can of this Fire, I shall endeavour to make the best Conjecture of the Cause of it, that I can draw from the Report or Experience of the Men entrusted with the Management of the Colliery, who being above Ground that Morning, shared not in the common Calamity. In order to which I must acquaint you with the Nature of Coal Mines, which are in general subject to Stith or Sulphur.

Stith, as vulgarly so called by the Pitmen, I think corruptly from Stench, or Stink, is a want of Air, or rather such a Foulness in the Air, that overcomes the Spirits of the Men, and so suffocates them, as well as extinguishes the Candles.

Sulphur differs in this, that as the other suffers not the Candles to burn, this makes them burn too fast ; and the Flame by the impulsive Quality of the Air, or attracted by the Sulphur, extends it self upwards into a prodigious length, and, as a Match lighted for the Discharge of a Cannon, as speedily sets on Fire that Vapour, equally destructive.

Now to prevent both these Inconveniences, as the only Remedy known here, the Viewer of the Works takes the best care he can to preserve a free Communication of Air thro' all the Works ; and as the Air goes down one Pit, it should ascend another ; but it happen'd in this Colliery, that there was a Pit which stood in an Eddy, where the Air had not always a free Passage, and which in Hot and Sultry Weather was very much subject to Sulphur : and it being then the middle of *August*, and some Danger apprehended from the Closeness and Heat of the Season, the Men were with the greatest care and caution withdrawn from their Work in that Pit,

and turned into another, but an Overrun, to no purpose, after this Change. and upon some Motion or other, being supposed, by a fresh, cool, moist, &c. Wind, which bet that unlucky Morning, the high Airs, & the Winds of all Sulphur, had gone too near the Surface, and met the Sulphur just as it was passing, & being at Sea, upon which the Sulphur immediately took Fire by this Cause, and so he proved the occasion of the Loss of himself and so many Men, and of the great Fire that ever was had in these Parts.

III *An Account of the Success of an Attempt to continue several Atmospheres of Air condensed in the space of one, for a considerable time. By Mr. Fr Hawksbee, F. R. S*

March 30, 1708.

I Injected with my Siringe into a very thick Flint-Glass Bottle, (which I had procur'd to be made on purpose for the Experiment) between four and five Atmospheres of Air, as the included Gage demonstrated, which continu'd in that State till about the 11th of August following; when looking on't, (as usually once in four or five Days) I found that the Air Injected at the prementioned time, had made its Escape, the Weather for a Week before (or thereabouts) having been very hot; especially one Day I observ'd the Spirit in the Thermometer had ascended one hundred and twenty Degrees above the Freezing Point. And notwithstanding the Bottle was continually kept under Water, yet the Cement

ment, that was made use of to fasten the Brass Cap to it, suffer'd such a Softness, as render'd it incapable to resist the Spring of the Injected Air. I observ'd, that altho' all the Air as was capable of spring was fled, yet the Mercury in the Gage remain'd about three quarters of an Inch in height, above the Surface of that in which its open end was immers'd; which was about a 6th part less space, than what the same Air posselt before the Injection, and still remains so, notwithstanding it is constantly expos'd to the open Air. Which manifestly shews, that the Springs, or constituent Parts of the Air, do not in time totally restore themselves after standing so long bent. And had not the Accident of Heat happen'd, but it had continu'd in that State, as at first Injected, for a Year or two, (as I hop'd for) I doubt not, but the Springs of it would have been render'd much more incapable of their Restoration. From hence it is easie to conclude, that if nine or ten Atmospheres of Air were condens'd in the space of one, and to remain in that State for a Year or two; that when the Vessel, that contains them, shall become expos'd open to the Air, that then Bodies, such as very thin Glass Bubbles, (supposing them not to be above five or six times specifically heavier than their like Bulk of common Air) would float on such a Medium, which would be very surprizing, to see a Body supported by an Invisible Agent. But I am not sure of this, for I cannot tell but it may be a means to render Air visible; From whence some Discoveries may be made, which otherwise it may be impossible to know. But let it happen how it will (for Nature will have her own ways) I doubt not but several useful Inferences may be made from such an Experiment.

IV. *An Account of an Experiment, touching the Production of Light within a Globe Glass, whose inward Surface is lin'd with Sealing-Wax upon an Attrition of its outside. By Mr. Fr. Hauksbee; F. R. S.*

THE seeming Congruity that appears to be between Sealing-Wax and Glass, in several Experiments already made in relation to Light and Electricity, producible on the Attrition of them, has already been taken notice of: And for a farther Confirmation of their agreeableness, take the following Experiment.

I took a Globe Glass about six Inches Diameter, into which when I had put a convenient quantity of broken Sealing-Wax, I held it over a moderate Fire, and continu'd so to do, till the Wax was melted; then turning it about from part to part, it soon had got a pretty thick Lining of it, (especially some parts, for I could not make it all alike) on more than half its inside: Thus placing it in a convenient Posture, I left it till it was perfectly cold. When (being Evening) after having fixt the Brass-work to it, I caus'd it to be exhausted of its Air; then fixing it on the Machine, to give Motion to it as usual, I no sooner held my Hand on that part of it, under which it was lin'd with the premention'd Wax, but the Figure of the Parts that touch'd it, was as visible on the inward Surface of the Sealing-Wax, as when the Glass alone is us'd for that purpose: The Sealing-Wax, where it is spread thinnest on the Glass, one can but just discern the Light of a Candle thro' it in the Dark; but some Parts are so cover'd with it, that it is at least one eighth
part

part of an Inch in thickness ; and even on those Parts, for ought that I could discover, the Light and Figure appeared, as vivid, and distinguishable, as any where else. The Light produc'd, is not at all discernible thro' the Body of the Wax, but only to be look'd upon thro' the transparent part of the Glass : and notwithstanding some parts of the Sealing-Wax did not adhere so close to the Glass, as others, yet the Light appeared on those parts as on the other. Now whether the Light produced on the Sealing-Wax, was from the *Effluvia* provokt by the Attrition of the surrounding Body of Glass, or from its own disposition so to do in such a Medium, I cannot determine ; it being of the same colour and likeness to that of Glass, in all respects, except, that upon a small quantity of Air being let into the Receiver, the Light wholly disappear'd in that part lin'd with the Wax, and not in the other. I farther observed, when all the Air was let in, that the Hoop of Threads being held over the Glass, the Threads would be attracted at a larger distance, from that part of it lin'd with the Wax, than the other ; which seems to me to proceed from the United Strength of both their *Effluvia*.

Upon a Repetition of this Experiment, I observed, that the Wax within the Glass would attract Bodies approach'd near its outside, and that even in *Vacuo* (which is a Discovery that I never could make from any other Body, in such a Medium, except the Magnet.) For holding the Hoop of Threads over it, while it was in that State, the Threads would be directed, but not with that Vigour as when all the Air was let in ; yet here was that sensible difference, that when the Threads were held over that part of the Glass free from the lining of Wax, the Threads would not be attracted, but approaching them within the reach of the *Effluvia* of the Wax, they would eagerly fly towards it. Hence it seems deducible, that the Figure of the Parts of Glass and Sealing-Wax

Wax, Fire, quick lime, others, &c. For to conceive how the Effluvia of one can penetrate and pass through the Body of the other, and there to act as if it was the same and the same with it.

V. *An Account of some Experiments, in relation to the Weight of Common Water under different Circumstances. By Mr. Fr. Hawksbee, F. R. S.*

FIRST. I took a Glass of Common Water, and having weigh'd nicely a Glass-Bottle in it, whose Bulk was equal to the Bulk of 575 Grains of the same Fluid; then I caus'd some of the same Water to be boyl'd over the Fire, and after that, it was included in *Vacuo* and there remained till it became of the same Temperature (as to coolness) with common Water. Thus to the utmost of my power, I endeavour'd to extricate all the Air out of the Water, thinking in that State it would become more dense than when I weigh'd my Bottle first in't; but contrary to my Expectation, I found that the Bottle had just the same weight in it, as before, which seems to confirm the impossibility to compress Water by force into a lesser space than it naturally possesses; for if upon the removal of such a quantity of Air from out of its Body, the Parts do not slide any closer together, how should a Weight laid upon its Surface, when its Interstices seem to be replete with Air, make any impression on it. The Body which was forc'd out of the Water by the prementioned means, I call Air, since, for any thing to the contrary that I can discover, it is subject to all the same Laws with it; but that the Water upon its

I i

Absence

Absence should not unite more closely than before, seems
 very likely; for I cannot conceive what Mat-
 ter must be in the Vacuities, since the Particles of Wa-
 ter are not to remain at the same Distances as if the
 Air were withdrawn, otherwise the Water of necessi-
 ty must become more dense. But to proceed, I caus'd
 some Water to be heated about Blood warm, when
 weighing my Bottle in it I found the Bulk of Water equal
 to the Bulk of the Bottle, which was about three Grains
 less than when cold; which shews, that the component
 parts of the Water are easily separated by Heat, and the
 Matter lodg'd in its Interstices, capable of Dilation:
 Then I took that Water that I had purg'd of all its
 Air (as near as I could,) and gave it a degree of Heat,
 not exceeding luke-warm; upon weighing the prementio-
 n'd Bottle in it, I found, that altho' the Heat it had
 receiv'd was very inconsiderable, yet the Bulk of the
 Water, in that State, equal to that of the Bottle, was
 now diminish'd two Grains: which plainly shews, That
 notwithstanding the Water contain'd no Air that I could
 discover, yet there seems a Matter latent in it capable
 of Intumescence.

VI. *A Relation of some strange and wonderful Effects of the Scurvey, which happened at Paris in the Year 1699. By Mr. Poupart. Taken from the Memoirs of the History of the Academy of Sciences.*

THE Gentlemen Administrators of the Hospital at Paris, commonly call'd *Hôtel-Dieu*, having been advertis'd of the vast number of Scorbutick Persons, which came daily into that House, or were brought there; as also of the strange Symptoms, and dangerous Consequences of this contagious Distemper, they gave Orders for their being remov'd to the Hospital of St. *Louis*, the 2d day of *March*, where many of them continued till the end of *August*, in the same Year.

The same of this sad Disease was now spread abroad when I went to the Hospital of St. *Louis*, with a design to make my Observations on it, in that place: And having obtained a free permission from Mr. *Tibault*, who was then chief Chirurgeon of that House; I soon perceived, that this Distemper had something in it of that cruel Plague, with which the *Athenians* formerly were Luc. lib 6 so unfortunately afflicted.

The Disease, which I am now going to treat of, was yet a true Scurvey; for they, who were Sick of it, felt, as common Scorbutick Persons do, pains in their Thighs, the Calves of their Legs, their Belly, and Stomach, and were deprived of the Motion, or Use of their Limbs, tho' they still retained their feeling. They were troubled with Head-achs, Convulsions, and such strange itching in the Gums, that the Children pulled off certain pieces of them with their Nails. The Blood, which

came from them, was Watery, Salt, and Corrosive; and the Stink, which came from their Mouth, was intolerable. They had hard blew Spots on their Legs and Thighs, frequent Hemorrhagies, or Bleedings at the Nose and Fundament, and also so great a Weakness in their Knees, that they could not go without reeling or staggering. These were the Symptoms which they had common with other Scorbutick Persons; now let us see what they had in particular.

When we removed these Sick Persons, we heard a small clattering of their Bones, which particular Mr. N. N. a Physician of *Rochell*, hath mention'd in his *Treatise of the Scurvy*, but he ingeniously confesseth he knoweth not the true reason of it: Here you have it, as I have observed it by my Experience.

I observed at the opening of all those Bodies or Cadavers, in which we heard the aforesaid little noise, that the *Epiphyses* were entirely separated from the Bones, which by rubbing against each other occasioned this clattering.

We have opened several young Persons, in whom we also perceived a small low noise when they breathed. In all these sort of Bodies we found, that the Gristles of the *Sternum* were separated from the Bony part of the Ribs; and as the Gristles are of a softer Substance than the *Epiphyses*, the noise, which their rubbing produced, was greater than that of those Bones which rubbed against the *Epiphyses*.

They, in whom we heard this noise at the time when they breathed, are all dead, except one young Man, whose ribs were visibly reunited to the Gristles, for after his Cure, we heard no more of this noise.

All those, in whose Breasts any Matter or Serosity were found, had their Ribs separated from their Gristles, and that Bony part of those Ribs, which were over against the *Sternum*, was rotted for the length of four
Fingers,

ingers: which is an Evidence, that the L. of this Bod is a most insamly Caustick.

The greatest part of those Bodies, which were opened had their Bones black, worm-eaten, and rotten.

Most of the Sick went staggering: this is an Accident common or usual to Scorbution Persons, and very well known to most Physicians: but the Reason of it, which you have here, is not so well known. It is certain, that the support of the Joints proceedeth from the force and spring of the Ligaments, which bind the Bones close to each other; the Ligaments of these Sick Persons, were corroded, loose, and the Bones were separated from each other; which proceeded from this, that instead of flowing in their Joints that sweet Oily *Lympha* (which commonly aboundeth there in order to make the Joints supple, and give them an easie free Motion) there was nothing but a greenish Water, which by its over Caustick Quality had corroded the Ligaments, and consequently destroyed the force of their Spring.

All the young Persons under Eighteen, had in some degree their *Epiphyses* separated from the Body of their Bones, and by the least endeavour or motion were separated them entirely. The reason of it is this, that young Persons have not yet their *Epiphyses* so strongly fasten'd to the Bones, so that when they are never so little soak'd with that Corrosive *Lympha* which is in the Joints, that Caustick Liquor may easily separate them entirely from the Bones.

All the Bones, which we found entirely separated from their *Epiphyses*, were more than twice as big as they should be in their Natural State, because these *Epiphyses* were separated in them only, whose Bones were well soak'd with a Water which had penetrated into their very Substance and made it swell.

The Bones of those which recovered, or were recovering, remained swell'd, without giving them any pain:

They

They might grow less in time, as it happens to Children, which are troubled with the Rickets, whose Bones grow dry by little and little as they grow up

All they who had any difficulty in Breathing, or had their Breasts stuff'd or stopp'd up, had there good store of *Lymph*, or Matter; and we often found more or less of them in their Lungs, according as they were oppress'd.

We have seen some Sick Persons, whose Breasts have been so oppress'd, that they died all on a sudden; in the mean while we found no Serosity neither in their Breasts nor in their Lungs: But the *Pericardium* was entirely fasten'd to the Lungs, and the Lungs were glued to the *Pleura* and *Diaphragma*; and all the Parts were so mix'd and blended together with each other, that they all made up but one Mass or Lump, so confounded, that one could scarce distinguish the one from the other: Now as the Lungs were squeez'd together in the midst of this Mass, they were deprived of their Motion, and the sick Person was choak'd for want of Breath. The close adhesion, and confusion of these Parts one with another, proceeded from this, that being Ulcer'd as they were, they must needs stick to each other.

The ordinary or common Scorbutick Persons have the Glands of their Mesentery much obstructed and swell'd; those we treat off, have theirs partly corrupted. and Imposthumes in the Substance of it.

In the Liver of some few, the Matter or Corruption was hardned, and as it were petrified; their Spleen was three times bigger than it should be, and fell to pieces as if it had been compos'd of coagulated Blood; and sometimes the Kidnies and the Breast were full of Imposthumes.

There were some Bodies or Cadavers of those of Fifteen, in which, if we squeez'd betwixt two Fingers the end of the Ribs, which began to be separated from
the

the Growth of the same abundance of corrupted Matter, till the Scurvy part of the Bone; so that after the freezing of it together, there remain'd nothing of the Rib, but two bony Plates.

We have seen some certain Persons, who had no other token of the Scurvey, but some light Ulcerations in the Gums. They had afterwards some small red, hard Tumours on their Hands, their Insteps, and in some other parts of the Body. After that, there appeared large Imposthumes on their Groin, and under their Arms-pits, attended with several Blue Spots on all their Body, which were the certain Fore-runners of Death. We found that the Glandules under their Arms-pits were very big, and surrounded with Matter or Corruption; as well as the Muscles of their Arms and Thighs, whose Intervals were all filled with them.

We observed some whose Arms, Legs, and Thighs were of a reddish Black, and as it were burnt, which proceeded from that black and coagulated Blood, which we always found under the Skin of those Persons.

Et simul ulceribus quasi in festis ossibus repletis
Corpus—————

We also found their Muscles swelled, and as hard as Wood; which proceeded from the Blood, which was fix'd in the Body of the Muscles, which were sometimes so full of it, that their Legs remained bent without being able to extend or stretch them out.

We observed that the Blue, Red, Yellow, and Black Spots, which appear in their Bodies who have the common Scurvey, proceed purely from extravasated Blood under the Skin. As long as the Blood kept its red Colour, the Spot was red; if the Blood is black or coagulated, the Spot is also black; when there is some Bile mix'd with it, the Spot is of a yellowish black; in short, accord-

according as the Blood is mixed with the Humours of different Colours, so also the Spots appear of a different Colour.

We sometimes saw on the Bodies of these Persons certain small Tumours, which grew bigger every day: we applied Emollient Ointments to soften them, and those Tumours on their breaking, formed a Scorbutick Ulcer; which proceeded from the Blood with which the Tumour was filled; for as often as we took off the Plaister, we still found under it a great deal of coagulated Blood, we put on a fresh Plaister, and some time after we still found under it coagulated Blood: we continued dressing of them after this manner, and by thus taking away the Blood, we entirely dried up the Tumour, and the Person was cured. Some old Persons had such large Bleedings at the Nose and Mouth, that they died of it, it being impossible to stop it, because the *Lympha* of these Persons was so sharp and corrosive (as I said before) that it corroded and eat thro' the Coats of the Veins. And this kind of Hæmorrhage was so much the harder to stop, because the Blood of Old Persons is more fluid and watery than that of young Persons, who are seldom subject to this Accident.

*Sudabant etiam fauces intrinsecus atro
Sanguine; & ulceribus vocis via septa coibat.
Aut etiam multus capitis cum sepe dolore
Corruptus sanguis plenus ex naribus ibat.*

Old Persons, as well Women as Men, were troubled with such mighty Fluxes, that the weakest of them died under them; but if they had strength enough to withstand them, they were soon cured.

*Quorum siquis, ut est, vitærat funera Leti
Ulceribus tetris, & nigra proluvie alui.*

There

There were some of these Sick Persons, who were so Collic in their Body, that they never could go to stool without taking some Glisters.

Several of them had such large Swellings over all their Bodies, their Hands, Arms and Feet, that they seemed to have been blown up. We cured several of them by proper Medicines, Glisters, and sweetning Juleps.

A Youth of Ten Years old, had his Gums much swelled and ulcered; his Teeth were eaten up to the Roots of them, and served no longer; and his Breath was intolerably stinking.

*Spiritus ore fœtas tetrum volvebat odorem,
Rancida quo perolent projecta canavera ritu.*

The Chirurgeon was obliged to pull out all his Teeth, for the better dressing of his Mouth, tho' they would have fallen out of themselves: His Gums were healed, but there arose a Tumour on the side of his Tongue as big as a Walnut. In the middle of this Tumour there was a bluish Hole, which degenerated into an Ulcer, which eat up half the Tumour, the other half remained whole and entire. Some small time after, there appeared another Tumour in the Cheek, which was very hard: It was Blue in the middle, and turn'd to an Ulcer also as the first. This Youth died all on a sudden, when it was least expected, and all the inward Parts of his Body were Corrupted.

All they who died suddenly, without having any visible Cause of their Death, had the Auricles of their Heart, as big as one's Fist, and full of coagulated Blood, which by putting a stop to the Circulation of the Blood, brought an inevitable Death on them.

There came in the Cheeks of several a small White Ulcer, which was hard all round; unless we took care to stop it presently, and to take it off with the Spirit of

Vitriol, it grew presently livid or blue, black and stinking, and eat up part of the Cheek, so that one might see the Teeth thro' it.

We have seen several from the Age of Eighteen to the Age of Thirty, who were without pain cast down stupid and without any Motion. They had their Mouth open, their Eyes sunk in, their Looks frightful, and appeared rather like Statues than Men.

*Atque animi prorsum vires totius, & omnis
 Languibat corpus, lethi jam limine in ipso.
 ——— Cavaati oculi, cava tempora, frigida pelvis,
 Duraque, inhorrebat rictum ———*

All these Persons had no apparent Sickneſs, only their Gums were Ulcered; their Skin was ſmooth and fair, without any Spots or Hardneſs: Yet we found their Muſcles were Gangren'd, and all wet with a black corrupted Blood, and in handling of them, they fell into Pieces in our Hands.

There was a Man who had a Carbuncle on his Inſtep, his Lips and his Noſtrils were chopped, and a ſtinking Water flow'd gently from his Noſtrils, This Man linger'd out a long time in a dying Condition: His Cadaver made me afraid, I durſt not open it.

A Young Man, who as to all outward appearance ſeem'd not to be very Ill, died ſuddenly. We found his *Pericardium* was ſo eaten up, that there remain'd but a little of it, and his Heart was Ulcer'd all about very deeply.

Scorbutick Perſons are commonly better in the Summer, than they are in the Winter, which may proceed from their great Tranſpiration. On the other ſide, theſe were indifferently well from the Month of *April*, to the beginning of *June*, the Spots, hardneſs, and other Accidents of the Scurvey then diſappearing; but on the
 coming

coming of the great Heats, all those Accidents returned. They who were so well, as to be in a readiness to quit the Hospital, relapsed again: Their Legs and Thighs grew all Black, and Death often put a Period to their Miseries. This Disorder might arrive from this, that there was such a great quantity of corrosive *Lympha* in them, that it was in a manner impossible for it to be carried off by Transpiration, so that by stagnating in their Bodies it grew hot, fermented, sower, and putrified; from thence arose those Corrosions, Ulcers, and great Imposthumes, Corruptions and other Accidents which we spoke of before.

All these Poor People eat very heartily to the last Moment of their Life; this proceeded from a sharp Humour, with which their Stomach always abounded, which created in them a kind of *Fames Canina*.

Nothing is so apt to corrupt the Blood as long Want; the use of ill Food is still worse; Cold stops the Circulation of the Blood, and makes the Blood remain too long in the Parts, where it sours and soon corrupteth; Sadness and Grief (which these poor Creatures are subject to) is worse than all the rest; and what all these may do when they meet altogether in one Person, we may easily judge. They produced there *Lympha's* of different Colours, with which the Belly, the Breast, and several other Parts of their Bodies were fill'd. Those *Lympha's* were so Caustick, that having put our Hands into their *Cadavers*, the Skin of them came off, and our Faces were thereby ulcered; so that we were obliged to rise in the Night to wash one's Face with fresh Water, to take off the Heat and Inflammation of it.

But that which was very surprising in this great Disease, was, that the Brains of these poor Creatures were always very sound and entire. Thus you have the weak Account of the dismal Effects of a Disease so cruel, that

there was no viewing 't with your Eyes, without raising a Sadness in your Heart

VII. *An Extract of a Memoir, concerning the Discovery of a Passage by Land to California; with a Map and Description of that Country. Presented to the Royal Council of Guadalaxara in Mexico, by Francis Maria Picolo. Taken from the Letters of the Missionary Jesuits, printed at Paris.*

Guadalaxara, February 10, 1702.

My Lords,

IN Obedience to the Orders you some Days ago honoured me with, I shall give you an Exact and Faithful Account of the Discoveries and Settlements, that Father *de Salvatierra* and my self have made in *California*, for these five Years past, that we have been in this large Country.

We embarked in *October 1697*, and passed the Sea that separates *California* from *New Mexico*. As soon as we set Foot on Land, the People being ignorant of our Design, (as not understanding our Language, or we theirs) imagining that we came to take from them their Pearl Fishery, it had been attempted several times before by others, came in great Multitudes against us, who had but an inconsiderable Number of *Spaniards* to defend us. The Violence with which they attack'd us, and multitude of Darts and Stones they threw at us, our Soldiers sustained so vigorously, that they beat 'em back with Success, and soon put them to flight.

Those

These *Indians*, after this Defeat, became more tractable; and seeing they could not gain any thing on us by force, deputed some amongst 'em to come and talk with us. We receiv'd them very friendly, and soon learned of them enough of their Language, to let 'em know the reason of our coming into their Country. These Deputies undeceived the rest; so that being satisfied of our good Intentions, they came to us in great Numbers, and shew'd a great deal of Joy to see that we were willing to instruct them in our Religion. This happy Disposition encouraged us to stay through the *Monqui* Language; in which, and in instructing the People, we spent two Years.

After this we thought of discovering other Nations, which that we might do more successully, the Father *de Salvatierra*, and my self, resolv'd to separate, and take two different ways: He went to the North, and I to the South and West. By this means Father *de Salvatierra*, by little and little, discover'd all those Habitations, that, at present, compose the Missions of *Loreto*, *Concho*, and *St. John of Lereño*: and I, all that Country, at present, call'd the Mission of *St. Francis Xavier of Buena Vista*, which extends it self to the South Sea.

In proceeding each of us his way, we observed several Nations of different Tongues mixt together: Some of them spoke the *Monqui*, which we understood: and others the *Laymon*, which we yet knew nothing of. This oblig'd us to learn the *Laymon*, which is of greater Extent than the *Monqui*, and seems to be Universal in this Large Country. We apply'd our selves so close to the Study of this second Language, that we learn'd it in a little time, and began to Preach indifferently to either.

Since our second Discoveries we have divided all this Country into four Missions. The first, that of *Concho*, or our Lady of *Loreto*. The second, that of *Buena Vista*, or

the 17, that of *St. Francis* is the fourth, which is now founded, & the other three, still are in the hands of the Indians. The Towns: The *Sancti Spiritus*, has nine belonging to it; viz. *Sancti Spiritus*, two Leagues distant; *Sancti Spiritus*, three Leagues; *Sancti Spiritus*, four Leagues: These three lie to the North, and the five following to the South: *Sancti Spiritus*, two Leagues distant; *Sancti Spiritus*, four Leagues; *Sancti Spiritus*, five Leagues; *Sancti Spiritus*, twelve Leagues; *Sancti Spiritus*, fourteen Leagues; *Sancti Spiritus*, fifteen Leagues. There are eleven Towns in the Mission of *Sancti Spiritus* or *Brando*, viz. *Quimaco*, or the *Guardian Angel*, at two Leagues distance; *Lichi*, or the *Mountain of the Light*, at three Leagues; *Sancti Spiritus*, at five Leagues; *Sancti Spiritus*, at six Leagues; *Sancti Spiritus*, at seven Leagues; *Piccolopi*, at twelve Leagues; *Sancti Spiritus*, at fifteen Leagues; *Onematto* at twenty Leagues: These eight lie to the South, the two following to the North; *Nunter* at three Leagues, and *Oble* at eight Leagues: *Curuoco*, or *St. Rosalia*, at four Leagues distance towards the East. The Mission of our *Lady of Grief* comprehends only *Unubbe*, on the North, *Nemqui*, or *St. Joseph*; and *Yodvunzege*, or our *Lady of Grief*, which gives Name to the whole Mission. *Nemqui* and *Yodvunzege* are two Towns very well Peopled, and are very near to each other. Lastly, the Mission of *St. John of the Evangelist* has five or six Towns. The principal are *Sancti Spiritus*, or *Sancti Bruno*, three Leagues distant to the East: *Anehu*, at the same distance, to the North: *Tamouqui*, at four Leagues, and *Diatro* at six, both towards the East: Besides *Sancti Spiritus* and *Lupon*, two Towns to the South, lately discovered.

Having given you an Account of the State of Religion in this New Colony, I shall proceed to answer, as well as I can, those other Articles you did the Honour

the Sea and the Land, which we have seen in the
the Rivers and the Mountains of the Country, the Ma-
nner of Living, and the Product of the Country.

California is pretty well placed in our common Maps.
The Heats in Summer are very great along the Sea-
Coasts; and it seldom Rains: but the Air of the In-
land Country is more temperate and the Heats not so
excessive. It is the same in Winter proportionally. In
the Rainy Season there are Floods; but when that is
over, instead of Rain, the Dew falls in so plenty every
Morning, that one would think it Rained. It which
renders the Earth very Fertile. In the Months of
April, May and June, there is with the Dew a sort of
Manna, which congeals and hardens upon the Leaves of
Reeds, from whence they gather it: It is as sweet as Sa-
gar, tho' not altogether so White.

The Climate must needs be Healthy, if we may
judge of it by our selves and those that were with us:
For during the five Years we were in this Kingdom, we
continued very well in Health, notwithstanding the
great Fatigues we underwent: And of the other *Spaniards*
there died but two; one of which was a Woman,
who occasion'd her own Death, by imprudently bathing
her self when she was near Lying-in.

There are in *California* (as in the most beautiful Coun-
tries in the World) Large Plains, Pleasant Vallies, Ex-
cellent Pastures, at all time, for great and small Cattle;
fine Springs of running Water, Brooks and Rivers with
their Banks cover'd with Willows, Reeds, and Wild
Vines. In their Rivers they have plenty of Fish, espe-
cially Crayfish, which they keep in a kind of Conser-
vatories, till they have occasion for them: Three of
these Conservatories I have seen, that were very large
and beautiful. There is also plenty of *Xenopus*, of a
better Taste than those of *Mexico*. So that we may
conclude *California* to be a very fruitful Country. On
th,

The Mountains there are all the Year long *Mescales*, a Fruit peculiar to this Country; and in most Seasons, large Pistachio's of several sorts, and Figs of different Colours. The Trees are very beautiful; and amongst others, that which the *Chinos* (who are the Natives of the Country) call *Palo Santo*, bears a great deal of Fruit; from this they draw Excellent Frankincense.

As this Country abounds in Fruit, it does no less in Grain, of which there are fourteen sorts that the People feed on. They use the Roots of Trees and Plants, and among others, those of the *Tyuca*, to make their Bread of. There are Excellent Skirrets; a sort of red Strawberries, of which they eat plentifully; and Citrons and Water-Melons, of an extraordinary size. The Land is so good, that most Plants bear Fruit three times a Year: So that with some labour in cultivating it, and skill in managing the Water, they render the Country extremely fertile. Nor is there any sort of Fruit or Grain, but what they gather in great abundance; which we experienc'd our selves: For bringing with us from *New Spain* Corn, *Indian* Wheat, Pease, Lentils, &c. we sowed them, and had a very plentiful Increase, tho' we had not any Cattle or proper Instruments to Till the Ground.

Besides several sorts of Animals that we knew, which are here in plenty, and are good to eat, as Stags, Hares, Coneys, and the like; we found two sorts of Deer, that we knew nothing of: We call them Sheep, because they somewhat resemble ours in make. The first sort is as large as a Calf of one or two Years old: Its Head is much like that of a Stag; and its Horns, which are very large, like those of a Ram: Its Tail and Hair are speckled, and shorter than a Stags: But its Hoof is large, round, and cleft as an Oxes. I have eat of these Beasts; their Flesh is very tender and delicious. The other sort of Sheep, some of which are White, and others Black,

Black, differ less from ours: They are larger, and have a great deal more Wool, which is very good, and easy to be Spun and Wrought. Besides these Animals, that serve for Food, there are Lyons, wild Cats, and many others of the like, as in *New Spain*. We brought to *California* some Cows, and store of small Cattel, as Sheep and Goats; which would have increased very much, had not the Necessity we were once in, obliged us to kill the greatest part of them. We likewise brought with us Horses and Colts to stock the Country, and began to breed up Hogs; but as these do a great deal of damage in the Villages, and the Women are afraid of them, we have resolved to extirpate them.

As for Fowls, there are in *California* all that are in *Mexico* and *New Spain*; as Pigeons, Turtle-Doves, Larks, Partridges of an exquisite Taste, and in great Quantities, Geese, Ducks, and many other sorts both of River and Sea-Fowls.

The Sea affords great Plenty of very good Fish: They take Pilchers, Anchovies, and Tunny's; which last they catch with their Hands on the Shoar. We often see Whales, and all sorts of Tortoises. The Shoars are fill'd with Heaps of Shells, larger than those of Mother of Pearl. The Salt that they have, is not from the Sea, but out of Pits: It is as bright as Chrystal, and so hard that they are oblig'd to break it with Hammers. It is a very good Commodity in *New Spain*, where Salt is scarce.

California has been known near these two Centuries; and its Coasts are famous for the Pearl Fishery, which has made the *Europeans* so desirous of establishing a Trade here. It is certain, if the King would erect a Fishery here at his own Charge, he might draw great advantage from it. Nor do I doubt but that there are Mines to be found in several places, if they were sought

for ; since the Country is under the same Degree as the Provinces of *Cinalao* and *Sonora*, where there are very rich ones.

Tho' Heaven has been so bountiful to the *Californians*, and the Earth brings forth of it self what it does not produce elsewhere without a great deal of Labour and Pains, yet they make no esteem of the Plenty and Riches of their Country ; contenting themselves with what is only necessary for Life, they take little care for the rest. The In-land parts of the Country are very Populous, especially towards the North : And tho' there is scarce a Town, but what has 20, 30, 40, or 50 Families in it, yet they have no Houses ; but defend themselves from the heat of the Sun in the day time under the Shade of the Trees, and of their Leaves and Branches make a sort of Roof against the Inclemency of the Night. In the Winter they shut themselves in Caves in the Earth, and live there together little better than like so many Beasts.

The Men go naked ; at least all were so, that we saw. They wear about their Head, a fine linnen Fillet, or sort of Network ; and about their Neck, and sometimes about their Arms, for Ornament, Mother of Pearl in divers Figures, very finely wrought, and prettily intermixt with little round Fruits, somewhat like the Beads of a Chaplet. They have no other Arms than Bows and Arrows, and a sort of Javelin, which they always carry in their Hand, either to kill their Game, or defend themselves from their Enemies ; for their Towns often make War upon one another.

The Women are somewhat more modestly clothed, wearing from their Waste down to their Knees a kind of Apron, made of Reeds very neatly wrought and matted together. * They cover their Shoulders with

with the Skins of Beasts, and wear about their Heads, like the Men, a very curious kind of Net-work; which our Soldiers find so convenient, that they make use of them to tie up their Hair with. They, as well as the Men, have Necklaces of Mother of Pearl, mixt with the Stones of some sorts of Fruit and Sea-shells, hanging down to their Waste; and Bracelets, in like manner of the same.

The common Employment of both Men and Women, is Spinning. They make their Thread of long Plants, which serve them instead of Hemp and Flax; or else of a Cotton-like Substance found in the Shell of some sorts of Fruit. Of the finer sort of Thread, they make the Ornaments abovementioned, and of the coarser, Fishing-Nets, and Sacks or Bags for several Uses. The Men moreover, of certain Plants, whose Fibres are very close and thick set, and which they are very well skilled in working, employ themselves in making Dishes, and other Kitchen Necessaries, of all Fashions and Sizes. The smaller Pieces serve for drinking Cups; those that are larger, for Plates and Dishes, and sometimes for Umbrells for the Women; and the largest sort for Baskets to gather Fruit in, and sometimes for Pans and Basins to dress their Meat in. But they take care to keep them continually moving, while they are over the Fire, for if the Flame catch them they are soon burnt.

The *Californians* have a great deal of Liveliness, and are naturally addicted to Rallery; as we found when we began first to instruct them. For if we committed any Error in their Language, they jested and made Sport at us. But after we were grown better acquainted and more familiar with them, if we committed any Faults, they civilly advised us of them.

And if at any time we explained any Mystery, or Point of Morality, not conformable to their Prejudices and Errors, they waited for the Preacher after Sermon, and disputed against him with a great deal of force and Wit: If we could give them good Reasons for it, they listen'd very attentively; and when at last convinced, submitted, and did accordingly. We have not found among them any Form of Government, Religion, or Regular Worship. They adore the Moon, and cut their Hair, (as I remember) in her Decrease, in Honour of their Deity; which they give to their Priests, who imploy it to several Superstitious Uses. Every Family makes Laws as they please, which is plainly the reason that they are so often at War with one another.

VIII. *De Variis Animalibus Philippenſibus, ex MSS.*
R. P. Geo. Joſ. Camelli. Communicavit D. Jac.
Petiver, S. R. S.

S E C T. I.

De Ranis, Bufonibus, Lacertis, Teſtudinibus, &c.

Rana.

1. **C**Abacab.
2. **C**Palaca.
3. Timbabalac.

Bufones.

4. Carao.
5. Cocac.
6. Colabocab.
7. Palacan languit.

Lacerti.

8. Bangcalang. Vid. No. 26.
9. Bayavac. No. 25.
10. Butiqui. No. 20.
11. Cagadagan. Vid. No. 24. & GAZOPH. NAT.
Tab. 40. Fig. 9.
12. Chamæleon. No. 33.
13. Crocodili feu Caymanes.
14. Dracunculus volans. No. 35. 6.
15. Hal. N. 37.
16. Hal. N. No. 29.
17. Ibir. No. 28.
18. Labi labi. No. 32.
19. Lacerti Parana.
20. Mabitan. No. 27.

21. Tagoto. No. 31.
 21. Timbabalac. No. 47.
 23. Toco. No. 45.
 24. Yguana *Luzon*. edulis, capite cærulefcente GAZO-PHYL. NAT. Tab. 40. fig. 9. *Gagafagan*, No. XI. vel *Layagan*, species est *Yguana*, seu: *Lacertus Scincoides bicubitalis*, qui *Caput* habet Pavoninè cærulefcentis, *rostrum* obtusum, *linguam* simplicem; ex fronte per nares protensam rubram & carneam excrefcentiam, qualis est *Gallo-Pavonis Indici*, aliam verò huic similem à vertice ad dorsum declinantem; *Corpus* fuscum, parvis squamis ut *Scincus* defensum; per *dorsum* excurrentem ferratam & magis prostantem pinnam; *pedes* anteriores sesquipalmes, posteriores spithamâ longiores, pentadactylos; longitudo *Ventris* spithamea, prouti & *cauda*, quæ spithamâ longiori, & palmam latâ, pinnâ supernè cristata est. *Carne* veltuntur *Indi*.
25. Bayava *Luzonis*, & *Iguana* Mexicanfium.
 26. Bancalang. *Lacertus* magnus. Species *Iguana*.
 27. *Mabitan*. Species *Iguana*, magnæ, nigræ, infestæ.
 28. *Ibir* vel *Ibid*, *Layagan* seu *Lalayan*. Species est *Iguana*, minor *Halone*, coloris subfusci, carens squamis.
 29. Halobiran. *Lacertus* magnus, magnitudinis *Europæi*, coloris *Ibir*.
 30. Butiqui vel Tabili. *Salamandra* albicans, cantans, caudâ latâ.
 31. Tagoto vel Pinit. *Salamandra* cantans altera, argenteo & fusco varia.
 32. Labilabi. *Hippoboscæ*. Species est *Stellionis*, vel potius *Bajo bandatus*. Vide Nic. Monardum de *Herba Scorzonera*. Gaudet palustribus: *Corpus* t., non prolongatum ut *Lacerti*, sed breve ut *Bufo*.
 33. *Chamaeleontes* alit *Luzon*: missi fuere cavæ inclusi D. Gubernatori ex Provincia
 34. Lagarto sin cola.
 35. Dracunculus volans *Looganus*, ex sicco desumptus, GAZOPH. NAT. Tab. 39. fig. 2. Gin-

Ginyayangao vel Manyayangao *Tagal.* Taborlan, Tambabuca, Bucabuca, Amumuga *Rys.* Tanoonocao *Bobolanis.* Galagag *Pampungis.* Serpe volante & Sactia *Hisp.* Lacerta est volans, minor *Chacone*, figura *Iguane*, cantans ut *Tagato*, No. 31, volans explicatis Membranis, quas contrahit cum quiescit, sub *cauda* nescio quid tintinnabuli gerens quò strepitum excitat, morfu venenosissima & mortalis. *J. Alzina* veneno carens, coloris ex flavo virentis (sed plures affirmant colorem referre rei cui inhæserit, ut *Chamaleonem*) alis membranaceis nigro & rubro variegatis ab anterioribus usque ad posteriores pedes protensis, volans ad 50 passus uno volatu. Capite gratiofo, erecto, *Equo* simili. *An* duplex, Venenata, & Veneno carens, coloris constantis, & mutabilis?

36. Dracunculus volans *Malagondanus* ex sicco delineatus. Spithameus ferè erat, sed admodum gracilis; coloris fufci, ad *dorsum* cœrulekens; dentatus ferræ modo; digiti quini in quolibet pede gracillimi; membranæ alarum vices præbentes subrotundæ, at anterioribus ad pedes posteriores protensæ, quibus costulis fulcitæ: *Cauda* tenuis, reliquo corpore duplo longior, squamata.

37. Halo. *Lacerti* est *Species*, seu *Iguane*, quam in *Luzone* Layagan & Ibir vocant. Major est, maculis rubris, flavis, & nigris varius; amphibium animal, nec nocivum, squamosum, vescum ut *Iguana*. Cum progreditur linguam exporrectam gerit. Vescitur fructibus & gallinis. Lapidem asservo ex *Halone* aterrimum, durissimum, ut *Pyrites* ad ignem excitandum aptum, globosofubplanum, scabrum, sublustrum ut *Pix*, variis atterebatur orbicularibus foraminibus, pendentem drachmas decem. Ad quid deserviat ignoro.

38. Buâya. *Crocodylus* major. Vulgò *Cayman*.

39. Barangitao. *Crocodylus* minor, anans fluvios.

40. Bayo. *Crocodylus* aterrimus.

41. Bacarium. *Crocodylus* flavens, à similitudine *Cor-*
ticis

ticis *Bexuci* Cariun. *Dentes* invicem arcte & pectinatim interuntur, superiores inferioribus & vicissim : *Ova* magnitudinis ovorum *Struthionis*, mollia ut *Testudinis*, quibus non incubat, sed arenâ sepulta ad fluviorum margines inveniuntur. *Cauda* pinnata est. Inter senos parvos, quos dissecui, masculum non reperi. Fugit fructûs *Hobom* nucem.

42. *Crocodylus* terrestris vulgo *Draco*, qui in Patria mea *Bruno-Moravia*, in Civitatis Domo Senatoria suspensus visitur, est magnitudinis majoris *Crocodili Indici*, sed cauda pinnis caret. Interemptus fuit vitulo exenterato, calce vivo impleto.

43. *Lacerti* *Torrentis Parana* in *Peruvio*, orgyiâ longiores, binos occultos gerunt *testiculos* magnitudinis ovi *Columbini*, tantæ fragantiæ ut *Ambari*, *Moschi*, & *Zibethi* suaveolentiam super ut. *Ant. Calantha* in sua *Hist.*

44. *Buaya Bayo. Batangan. Binatang. Birangitao. Bacarium.* Nomina sunt *Crocodylorum*. Visi sunt longitudinis orgyiarum octo, in quorum faucibus apertis homo majoris staturæ stare potest. Insidiantur *Bobus*, *Equis*, *Buffalis*, *Hominibus*, præsertim *Æthiopibus*, & *Canibus*. Oculos habent binos; unde hallucinantur, qui duos illos hiatus ad mandibulam internorem inspirationi deservientes, pro oculis habuere. Carent lingua discreta & sanguine; vias verò communes, quibus corpus exonerent, habent. *Ova* 80 & 100 unicus ponit; filios mater hiante ore excipit & devorat. *Pinguedo* laudatur ad vulnera & nervorum contractionem. Cinerem pellis *Crocodili* ferunt tollere & abolere sensum, cum membrum aliquod amputandum est, aceto subactum & Cataplasmatidis forma impositum. Pro Ventriculi affectu pulverem verò, cum Vino calido potum, urinam efficaciter pellere.

45. Stellionem *Luzonis* sive *Lacertam* cantorem majorem seu *Nirembergij*, Hispan. *Chacon*, Indi B. *Ticqui*, vel *Tac. Toco* vel *Tucqu* T. Mexicani *Teque* vocant. Longa est sesquispithamam; *Caput* biunciam, amplum; *dentes* acuti; lingua majuscula; *oris* rictus magnus, prouti &
Oculi

& Aurium finus, cauda ejusdem cum corpore longior, quinque pedes pentadactyli, corpus totum & luculentum squamulis, & 12 altius prominentium papularum in caudam usque excurrentium ordinibus asperum, & reticulatum, maculisve rubeo-ferrugineis, caeruleis, glaucisve variegatum. Senectam seu exuviale liberidem deponit. Serpentum more, ad Epilepsiam commendat *Jonst.* Ves- citur *Insectis*, *Muscis* præsertim, & *Proscarabeis Cucarrachis*, quorum partes indigestibiles inconfectas primum, dein excrementum egerit albissimum, quod in decoratione & abstergendis lichenibus deservit. Verrucas delet *Jonst.*

46. Scinci Ex. Antiepilepticum *Serapioni*. Oculorum maculas extergens *Plinio*.

47. Timbabalac. *Lacertus* est magnus innocuus, coloris *Cinamomei*, nitidus, squamosus; degit locis herbosis, & gaudet æstuariis *Chamæpalma Nipa* confitis.

48. Magdaraog vel Daranavan. *Testudo* marina conchifera, non vesca, tantæ quandoque magnitudinis, ut in ejus scuto tres homines simul ac semel tanquam in monoxilo aut cymba fluvios tranare possint. Hæc aliquando totaliter candida capta fuit. Annulum ex cauda paratum aeris contagio resistere ferunt.

49. Punos. *Testudo* marina, ædulis; cortex scuti inutilis est ob teneritudinem.

50. Pagong T. *Testudo* est terrestris, *Hispanis* Galapago. *Sina* ex ea Febrifugum parant modo sequenti: & *Testudinem* montanæ minorem, cui per medium dossi clavum majorem ferreum adigc, quo extracto, foraminum *Arsenici albi* 3j. immittito, & *Testudinem* adhuc spirantem, probe oblutatam, in cinerem reducito. Cinerem dem a luto diligenter separatum mucilagine *Orizæ* subige, & pilulas forma *Pisi* magnitudinis, quarum unica ante paroxysmum febrilem exhibita febrim fugat. N. B. *Hel* calculum dissolvere tradunt.

51. Pampangi Pau. *Bysaiani* *Pahas* vocant.

52. Paucan. *Testudo* marina magna.

53. Labilabi. *Testudo marina Malindgensis*.
De *Testudinibus marinis* communicavit *Franciscus Antonius* de la *Zarza* sequentia.

54. *Testudo marina* genericè *Paucan*.

55. *Paucan* Specificè *Testudo* est magna, vesca, testa tenui, inutili, circa littora degens.

56. *Magdarahic Femina*. *Daranauan Mas*. Species est *Paucan* sed major, pariter vesca, & testa tenui, non nisi in alto Mari obvia:

57. *Catoan Femina*. *Afog Mas Boholanis*. *Olaniban Leytensibus*. *Testudo* est magna, non vesca; testa crassa, subfusca, & vix picta.

58. *Capala Boholan*. *Ilag Leytens*. *Testudo* est marina, non vesca; concha, seu testa, crassa, & alba.

59. *Testudo Marina* 5. *Concha* est tenui, rostro simili *Psittaco*; intestinum habet unicum, & hoc breve. *Caro* venenum est mortiferum.

S E C T. II.

De Insectis *Reptilibus*: *Formicis*, *Lumbricibus*, *Teredine*, *Scorpione*, *Oniscis*, &c.

60. *Bondo*. *Formica* est nigra maxima. *Nidus* ex limo cum variis fornicibus & concamerationibus, ubi sepe ratim asservant alimentum ex granis, ex insectis mortuis, & excrementa: in medio nidi Rex rubeus, aut albicans, corporis magnitudine quandoque digiti Indicis. An *Nirembergij* *Formica* sex digitos longa? *Sulum*.

61. *Hautic*. *Formica* nigra, magnitudinis *Vespe*, *Bysaniensis Amimitas*. *Nidum* componit in arborum ramis ex convolutis foliis & telis, telis araneorum similibus. Ex morfu dolor vehemens, ut *Bondoc*. Harum No. 4. vel 6. exhibent veterinarij cum *Oriza* caballis, quibus devoratis Vermes, in cavernosis Ulceribus scatentes, expelluntur & excidunt.

62. *Amtig*. *Formica nigra*, minor præcedente, ex morfu intollerabilis pruritus & inflammatio.

63. *Acot*.

63. Acot. *Formica* nigra, parva, innocua, similis *Europææ*:

64. Langam. *Formica* rufa, fatua, longipes, communis.

65. *Guyam*. Minor præcedente.

66. Hantic. *Formica* est altera, rufa, capite magno, mordens, & nocifera. *Vulgo* Holandefa.

67. Cuyitib. *Formica* parvo pediculo suppar, albicans, morfu molesta; hæ notabilem & molestum edunt fridorem in culcitris & cervicalibus, ubi nidulari assuere, ut incredulus expertus sum.

68. Culitap. *Formica* albicans, longipes, innocua, major priore.

69. Dalodalo. *Formica* est alata.

70. *Lac-ha* Indorum. *Formica* est subrufa, *Europææ* triplo major, in arbore *Narra*, seu Ligno Nephritico degens, & ibidem ex materia fusca, resinoso-gummosa, Indis *Busqu* & *Baroque*, nidos construens, ad favi apicularum similitudinem efformatos.

71. *Lac-ha major*. Ad maris littoralia, æstuarialia, & paludosa loca, in acervis ex ramusculis, aliisque quicquid congeitis nidulatur. *Busqu* & *Baroque*, seu *Laccam* congerens, ut prior. Hæc *Lacca*, seu Resinosa materia *Indis* deservit in suffumigio pro puerperis ad facilitandum partum, secundinas ciendas, aliosque uterinos affectus; pro *Cera* item *sigillatoria* conficienda: Sinensibus verò Insectoribus non ad coloris florem, sed colorem constantem reddendum.

72. *Lac-ha*. Item nescio quale præterea insectum vocant simile *Formica*, cujus ovis Indi antiquitus dentes rubro inficere solebant. An *Cochinilla* arb. *Ansuhang*?

73. *Anay*. Species est majoris *Formicae*, candicans, capite rubro, vetula nigricat, brevipes. Insectum damnosissimum, *Blattis*, *Tineis*, & *Teredine* pejus; lignis, vestibus, & Libris unica nocte plus damni inferens, quàm *Blatta*, *Tinea*, aut *Teredo* per plures Menses: hinc alij *Heluones Librorum* vocavere. Progrediens semper sub fornicata prorepens semita, sive arbores sive Parietes subeat.

Ubi

Ubi nidulatur, attollit limosæ materia æcervos magnos, internè favi Apum ritu elaboratos, variisque semitis pulchro ordine pervios. Liniosa *Nidi* materia in suffumigio ulcera desiccata manantia.

74. *Cossus*, *Indis* Aramay.

75. Sorot *Indorum* est *Teredo*. Hispan. *Cartoma*. Parva, cum forcipulâ nigrâ.

76. *Tambiloc Indorum*. Species est *Teredinis* maxima, vesca. *Vermis* est pinguiculus, albicans, digitum auricularem crassus, aliquando etiam sesquicubitum, ut ferunt, longus : innascitur lignis in littoribus computrescentibus, unde extrahunt, & in hodiernum iis vescuntur *Indi Luzonia* & adjacentium Insularum.

77. *Lumbricus terrestris* ordinarius. *Indis* Bulati.

78. *Lumbricus terrestris* major. *Tiva*.

79. *Lumbricus Humanus*. *Olay*. Anno 1681. In Insula *Catanduan* affectus Eademius plurimos sustulit : conquærebantur ægri de tussi sicca & rosionis sensu in ventriculo. Aperto tandem defunctorum uno, invenit *Lucas Cadabdad* Medicafter Indus in ventriculo extraneæ figuræ vermem, qui in præsentia *D. Francisci de Quiros*, nec superafuso aceto, nec succo *Limoniæ*, nec spiritu *Orizæ*, sed succo *Pinæ*, seu fructûs *Ananæ* tandem interiit : quo viso, dein plures centum eodem affectu laborantes, assumpto in aurora fructu *Ananæ*, liberati fuere.

80. *Lumbricus Caninus*. *Oliyabir*.

81. *Tinea* pilorum radices exedens, Hispan. Zarzuela.

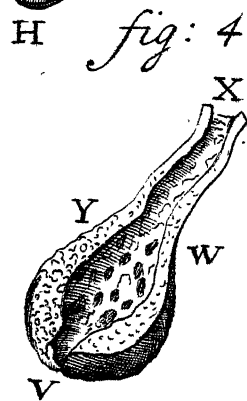
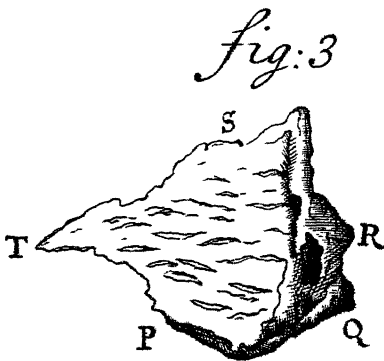
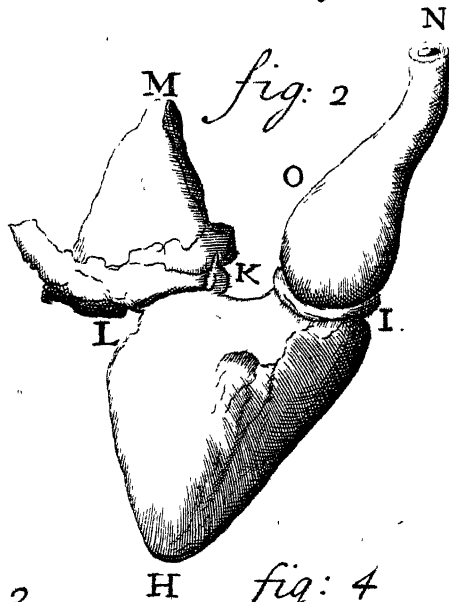
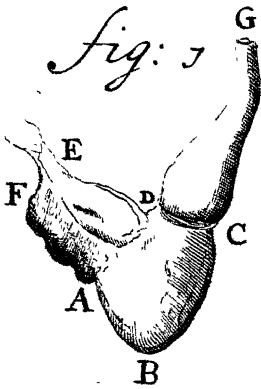
82. *Onisci* vel *Aselli* ordinarij *Indis* Bavibavian & Babuybabuyan.

83. Species altera ad pontes degens major est, caudâ bifurcatâ.

84. *Albulus*. *Vermis* est *Onisco* gracilior, hexapus, antennis & caudâ trifurcatâ donatus, argenteâ quasi farinâ illitus, *Libros* destruens & arrodens.

85. *Antonius Kirsbaumer* retulit se sæpius cum Socijs observasse *Ingolstadij*, sub *Pyro* quiescens, delapsos ramunculos rudes & nativos in *Vermes* conversos, mox in veste obrepisse.

86. *Scorpio*. *Indis* *Alangatung* & *Urangurang*. Exuviam deponit, vix nocuus, ictus dolorificus. Huic medetur *Allium* & *Lapis Colubrinus* vulgaris.



PHILOSOPHICAL TRANSACTIONS.

For the Months of January and February, 1709.

The CONTENTS.

- I. *A Letter from Mr. Anthony van Leeuwenhoek, F.R.S. concerning the Circulation of the Blood in Fishes, &c.*
- II. *Several Experiments touching the seeming Spontaneous Ascent of Water. By Mr. Fr. Hauksbee, F. R. S.*
- III. *An Account of an Experiment touching the different Densities of Common Water, from the greatest degree of Heat in our Climate, to the Freezing Point, observ'd by a Thermometer. By Mr. Fr. Hauksbee, F.R. S.*
- IV. *An Account of some Experiments, in relation to the Weight of Common Water, under different Circumstances. By Mr. Fr. Hauksbee, F. R. S.*
- V. *Epistola D. Guidonis Grandi, Societatis Regalis Londin. Socii, ad Illust. Comitem D. Laurentium Magalotti, dictæ Societatis Socium, De Natura & Proprietatibus Soni.*
- VI. *Part of a Letter from Mr. Ralph Thoresby, F. R. S. to Dr. Hans Sloane, Reg. Soc. Secr. concerning some Roman Antiquities found in Yorkshire; and a Storm of Thunder, Lightning, and Rain, that happen'd there, Aug. 5, 1708.*

I. *A Letter from Mr. Anthony van Leeuwenhoek, F. R. S. concerning the Circulation of the Blood in Fishes, &c.*

Delft in Holland, August 28, 1708.

SOME time ago, I viewed the Hearts of several Fishes, and particularly that of the great Silver-Eel, which I cou'd not be weary of looking on, and observing its motion that lasted near four Hours, after 'twas out of the Body of the Fish; and the rather because that Motion was so regular; for when the Blood is protruded out of the Heart, it is not brought into the great Arteries with the same swiftness, which in that case wou'd be over-charged with the great quantity of Blood: but the Blood thus coming from the Heart, is forced into a little white Vessel, almost of the Figure of a Pear, and which one would take for a kind of a Bladder; one Orifice of which was united to the great Artery, and the other to the Heart; in the latter Orifice is a Valve, the use of which is, that (when the Blood is protruded from the Heart into the aforesaid Vessel that I described to be like a Pear) it might not run back again into it: which Vessel having been cut across, I observed the inside of it to be furnished with so many small Particles, that 'twas in a great measure fill'd with them; and these internal Particles I conceive to be made, to the end that when the Blood is protruded into the Vessel, by dilating and contracting it self it may presently force the same into the Great Artery.

When

When this Blood at every Protrusion came from the Heart into the aforesaid Pear-like Vessel, the said Vessel was very much extended in roundness; and then immediately the extended Parts were again contracted, or drew themselves in, to the end that they might in this manner regularly, and without intermission, protrude the Blood into the Artery: for if this sort of Vessel were not united to the Heart, the Blood cou'd not be conveniently carry'd into the Arteries, because the Arteries cou'd not so largely extend themselves; and then, in my Opinion, at every Protrusion of the Blood from the Heart, there wou'd be a stop put to its flowing into the Arteries for a small instant of time: whereas in this case the Blood is almost always running with an easy and constant Course; tho' at every Protrusion it must be in some manner quickned, yet that is so insensibly, in my Opinion, that no Body can observe or feel it.

Now according to this constant Protrusion of the Blood into the Arteries of Fishes, without the least intermission, I am of Opinion, that the same thing happens as regularly, and after the same manner, in the Protrusion of Blood out of the Heart into the Arteries of Beasts; and thẽ rather because we always find, that the Great Creator of all things does bring about his Operations in the bigger Creatures, after one and the same manner, tho' their Hearts are of a different Figure from those of Fish.

I have formerly communicated to the Honourable Society some Discoveries of mine, relating to the Circulation of the Blood in Eels, consisting in this; to wit, that the Blood coming out of a great many small Vessels in the Tail of an Eel, falls in, and is united in one greater Blood-Vessel, where is the first beginning of the Fish-Bones, and where the Blood runs thro' a Valve, which I have not only observed myself, but have likewise shewn to several Curious Gentlemen, who view'd it with a
bundance

undance of Pleasure and Surprize ; for the Blood-Vein was not only moved in that part where the Valve is, but the Parts about the Blood-Vessel, of the breadth of four or five Hairs, were likewise moved or stirr'd ; from whence it appear'd, that at every Protrusion of Blood into the Heart thro' the Valve, the Blood stood still about an instant of time, and that the same Blood falling thro' the Valve, ran with great swiftness, and was thickest just at its Protrusion out of the Valve, but ran thinner or slenderer like the Figure of a Pear ; and the Vein that received this Protruded Blood, was not intirely fill'd with it, but seem'd for a small space to be as it were empty, and the Parts of it contracted, which we cou'd perceive for a small time, and further observing it, saw the Blood run slowly and leisurely along the same Vessel.

From this Observation I imagin'd, that the same thing happen'd in the Heart of a Humane Creature, *viz.* that there is a gentle and slow Protrusion of the Blood out of the Heart into that Vessel, which we call the Artery, and consequently that there is no such motion there, as what is called a Pulse, and which is felt in the extreme Parts of the Body ; but that the so named Pulses are only caused by the Protrusion of the Blood thro' the Valves that are in the Veins, but I never observed any violent or swift Protrusion of the Blood into the Arteries, as often as I have view'd the Circulation thereof : and tho' the Blood, by the Contraction of the Heart, be suddenly and hastily protruded out of it, yet its slowly carried into the Artery ; whereas on the contrary, it runs into the Heart from the Veins with a violent and swift Course ; from whence it happens, as I suppose, that the remaining part of the Blood in the Veins being unable to follow with so swift a Motion, are as it were violently and *per saltum* drawn or forced thro' the Valves, and that it is this sort of Motion which we take for Pulses in the Arteries.

That

That I might satisfy my self in the above-mentioned Observations, I have several times, viewed that sort of Motion in my Arm, which we call the Pulse, at the time when my Bed was without motion and warm; and after a diligent Consideration of it, I judg'd that that Motion, which we perceive in the Blood-Vessels, was not derived from the Heart to the Hand, but contrariwise from the Hand to the Arm, and so to the Heart: From whence I concluded, that like as in the Tail of an Eel there are no Valves in the Blood-Vessels, as far as I cou'd perceive, and that a great many small Blood-Vessels, are, as it were, united in that part where the Fish-bones begin, and make one large Blood-Vessel, and that there is the first-Valve; in the same manner in Humane Bodies, a great many single Blood-Vessels running out of the Hand, are joyned in the Arm, where likewise the first Valve is, thro' which the Blood at each Protrusion falls into the Heart, and that that is what we call the Pulse.

I have several times observed in the exceeding small Veins or Capillary Vessels, a little rising or swelling occasion'd by a stronger Motion of the Blood, which I now firmly conclude, to proceed only from the sudden Motion or running of the Blood thro' the Valves: I have also observed, that in sudden Brights, and otherwise, one feels such Motions at the end of one's Fingers; just as if there were Valves likewise in them, thro' which the Blood gushes; but these sort of Motions, I suppose, do only depend on that quick Motion made by the Blood, when it runs thro' the Valve in the Arm by the Hand, to which we give the Name of a Pulse:

'Tis said, that there are Valves in all the Veins of one's Body; but I can hardly admit that Assertion, for if there were Valves in those Veins; which we can see with our naked Eye thro' the Skin, for instance, either of the Hand or the Arm, we should certainly, in any

Opinion, discover likewise the Blood running thro' those Valves: and again if there are Valves in the aforementioned Veins of the Arm or Hand, we should not be able by pressing those Veins with the Finger to drive the Blood back again, which notwithstanding is often done.

Moreover, if there were Valves in the Veins that lie in the Skin expos'd to our sight, there wou'd, in my Opinion, a great many Inconveniencies arise therefrom; for if a Blow or Thrust were made upon that part where the Valves are, the Blood would not be able to retire back, by which means the Valve or even the Vein it self might burst: whereas, if there are no Valves, the Blood can easily retreat upwards or downwards in the Veins, as we, in Fact, observe of those Veins that run on both sides in the Tail-Fins of an Eel, which do not unite in one greater Vein where a Valve is, at least as far we cou'd follow those Veins with our Eyes.

Having thus far committed these my Observations to Papers, I considered with my self, whether I might not have something of this nature lying by me, having formerly consider'd this Subject of Eels; and I find amongst other Papers, these that follow.

In the Month of *September* 1706, having opened an Eel, and taken out the Guts, the Diameter or thickness of which was about an Inch and a half; and having also laid open the Heart, I cou'd not discover that part which receives the Blood out of the Great Vein in order to bring it into the Heart.

But to the end that I might better discover that part, I prepared a little Glass-Tube, and put it into the great Vein at a little distance from the Heart, and then blew some Air into the said Vein, as much as might take up the space of about half a Pea: this Air pass'd thro' the Great Vein into a little Bladder that lay on the side of the Heart, the like of which I had never before observed

ved thereabouts ; and no sooner was the Air got into that Bladder, but it did, as it were, first contract and then dilate it self, so regularly and in such a manner, that when the Heart contracted it self (just as if it were going to throw out its Blood,) the aforesaid little Bladder with Air in it was dilated ; and this did not happen for a small time, but the Bladder continued in such a Motion above five full Hours together ; but indeed in the last Hour it was so faint, that one could but just perceive it ; and as for the Heart, its Motion was discontinued.

I caused moreover a Pike-fish to be brought me about two Foot long, and open'd it immediately whilst it was in its full strength of Life, and observ'd not only the Motion of the Heart, and the regular Motion of that part which receives the Blood, and brings it into the Heart, but also the Motion of that other part, which receives the protruded Blood from the Heart, and carries it gently into the Arteries.

Now because very few have any manner of knowledge of the Heart of a Pike, and the Motion thereof, I have caused such a Heart, with the Vessels and Instruments belonging to it, to be drawn by my Painter.

Fig. 1. A, B, C, D, shews the Heart of a Pike ; D, E, F, A, represents that part into which the Blood is brought from the Veins ; and C, D, G, that other part which receives the Blood from the Heart, to carry it into the Arteries.

Now when the Heart receives the Blood which is conveyed into it, it dilates it self into its utmost roundness ; and then that Instrument or Vessel describ'd by A, D, E, F, does at that very instant fall as it were quite down from its Swelling or Extension, and discharging it self of its Blood into the Vessel C, D, G, all Parts of it become extended by the sudden pouring in of the Blood ; and no sooner is it so dilated, but it draws it self in a-

gain, and is contracted on all sides, to the end that it may force the Blood into the Arteries. In short, when A, D, E, F, is contracted, and throws the Blood into the Heart, the Heart is dilated; and when the Heart shrinks it self in, and is contracted by the Discharge of the Blood, C, D, G, is dilated; and these three several Motions happen in so short a time, and are perform'd so regularly, that those who have observ'd it curiously, are quite astonish'd at it: and from hence we can't but conclude, that such a Motion as this cou'd not be brought about, unless the Vessel A, D, E, F, had a Valve at A D, where it is joyned to the Heart, which Valve is to prevent the Blood that is throw'n into the Heart, from returning the same way; and so likewise there must necessarily be another Valve at C, D, to hinder the Blood, that is pretruded from the Heart, from flowing back into the same.

I have also taken the Heart of a Salmon, and caus'd that to be drawn, as you may see in *Fig. 2.* H, I, K, L; in which Figure K, L, M, represents that Instrument that was describ'd in *Fig. 1.* by A, D, E, F; as I, N, O, shews that which in *Fig. 1.* was C, D, G.

Moreover in *Fig. 2.* I shew you the Instrument K, L, M, cut open; to the end that we might discover, as well as we could, with the naked Eye, the Sinewy Parts and their Branches; all which appear'd as in *Fig. 3.* P, Q, R, S, T, in which Q, R, is the Part that was joyn'd to the Heart, and is the same that, in *Fig. 2.* is represented by K L; in the said *Fig. 3.* you may observe how the Sinewy Parts and their Branches run from Q, R, to T; this Instrument, or Vessel, is very soft in its Parts, and it seems to me also, that it is not strong.

Fig. 4. V, W, X, Y, is that Vessel dissected, which in *Fig. 2.* is represented by I, O, N; which Vessel is exceeding thick and strong, and is like the Instrument described

scribed by *Fig. 3.* and is provided within with strong Sinewy parts, to the end that when the Parts are extended by the Blood that is pour'd into them, they may be able both in roundness and length to carry the Blood into the Arteries: these Parts, by reason of the great number of them, cannot be delineated in such manner as they ought. •

These my new Positions will appear strange to a great many People, and I make no question, will meet with much Contradiction; because it has been the fix'd Hypothesis of all the Learn'd Men, both past and present, that have exercis'd themselves in Anatomy, that the Arteries receive such a Motion from the Heart, as we call the Pulse: whereas I have now shewn, that the Heart does protrude the Blood gently into the Arteries; and that the Blood, which flows from the Veins into the Heart, causes such a sudden snatching or revulsion, that it can't so immediately pass thro the Valves; in which part also the Veins are a little narrower, by which means there is a kind of a stop or intermission in the Circulation of the Blood: and this, I say, is the Cause of that Motion, which we call the Pulse. •

II. *Several Experiments touching the seeming Spontaneous Ascent of Water.* By Mr. F. Hauksbee, F. R. S.

EXPERIMENT I.

THE several Experiments, which already hath been made in relation to the Spontaneous Ascent of Water in small Tubes, not only by my self, but several others, with much the same success, gave me the occasion of thinking, whether the Figure of the Vessel might, or might not, contribute to the oddness of the Appearance. And to give my self that Satisfaction, (an Account of which I thought would not be unacceptable to the Society) I proceeded as follows.

I procured a Couple of Glass Planes, about seven Inches long, and one and a half broad ; these Planes were part of a broken Looking Glass ; and notwithstanding when clapt together, they seem'd to touch one another in so many parts, yet when they came to be immersed in a Liquid, the Liquid would ascend between them ; but so thin and colourless it was, that it could not without difficulty be discerned, but upon the separation of them, when they would be found wet on all their parts : therefore to make it more obvious, I put a small piece of thin Paper on each corner ; by which means, when laid one on the other, they became separated by such a distance, as is equal to the thickness of the Paper. In this manner I plung'd one end under some strongly ting'd Liqueur ; where it no sooner arriv'd, but the Water run

(but

(but not with that Velocity as in a small Tube) gradually, sometimes higher in one part than in another, shooting it self very pleasingly into Branches divers ways, and so would continue till it had arriv'd to its greatest height; but that would be according to the distance the Planes were plac'd asunder: for it, instead of one, two pieces of Paper were laid on each corner of the Planes, the Water then would not ascend so high between them, as when they were separated only by a single one. And then, if the Planes were any ways declin'd, the Water would still spread it self farther and farther, agreeable to the degree of Declination: and this on several tryals succeeded much the same.

EXPERIMENT II.

Having seen the success of the former Experiment in the open Air, I was willing to try what appearance it would afford in *Vacuo*; accordingly I fixt the two Planes so to a Brass Wire, (which pass thro' the Cover of a Receiver) that I could make them descend at pleasure. In this manner, with a Dish of ting'd Liquor, I convey'd them within the Receiver; which having plac'd on my Pump, I proceeded to exhaust its contain'd Air, which the Gage, in a little time, discover'd to be pretty nicely done. Then I plung'd the Planes (separated by Pieces of thin Paper as before) into the Water, where, as in the open Air, it arose between them; only with this difference, that there appear'd more Intervals, or Spaces, between the Branches of the ascending Liquid, than in the former Experiment: but when I came to let in the Air, those Intervals vanish'd, and an intire Body of the Liquid succeeded; yet the exact form of the upper parts of it remain'd unalter'd.

EXPERIMENT III..

By the foregoing Experiments I found, that neither the Figure of the Vessel, nor the Presence of the Air, did any ways assist in the Production of the forementioned Appearance. To try therefore whether a quantity of Matter would help to unriddle the Mystery; I produc'd two Tubes of an equal Bore, as near as I could, but of very unequal Substances, one of them being at least ten-times the thickness of the other; yet when I came to plunge them into the prementioned Liquid, the Ascent of it seem'd to be alike in both. Now since the form of the Vessel, the presence of the Air, or the quantity of Matter that composes the Vessel, do not any thing contribute to the Production of the Phenomenon, it may not be amiss, to inquire a little into the Nature and Property of some other Body, that operates with equal Vigour, under the prementioned Circumstances; and by a Comparison of one with the other, we may at length arrive nearer to account for the same.

What I shall now use to compare with these Experiments, is the Magnet.

First, A Magnet of any form will attract Iron.

So by the first Experiment, the Figure of the Vessel seems no ways to contribute to the Ascent of the Water.

Secondly, The Magnet is no ways lessen'd in its vigour of Attraction, even in so thin a Medium as a *Vacuum*.

So by the second Experiment we find the presence of the Air to be no ways necessary to assist in the Ascent of the Water, in small Tubes, or between the Planes.

Thirdly,

Thirdly, The Magnet, as suppose one of a Pound weight, that will take up or suspend a piece of Iron of the like weight, and no more, (supposing it to be in every part of equal vertue) when separated and broke into a number of small parts, (imagining them not to weigh above half a Grain each) and these dress'd, and Arm'd according to Art, will then be capable to suspend fifty, nay perhaps a hundred times more the weight of Iron amongst them now separate, than they could when all of one Mass; which appears to me, that the Attractive Quality of the Stone seems to be increas'd in Proportion as its Superficies is to its Bulk of Matter.

So by the third Experiment, I found that the Quantity of Matter, that was us'd to compose one Vessel more than the other, signify'd nothing to the Ascent of the Water, which seem'd wholly to depend on the largeness, or the smallness of their Cavities, as to the height it would arise in them; and as their Cavities are lessen'd, so the Disproportions of their inward Surfaces to their Cavities are increas'd.

And as the Magnet, when separated into the prementioned number of small Parts, will attract more than when united in one, and is no more than separating or working the prementioned thick Body of Glass into a number of small Tubes, that is multiplying the Surfaces; the Water then will rise in each of them singly, as it would when all in one Body, its Cavity being the same with the others; by which means, the quantity of Water ascending in them is augmented from the same Quantity of Matter.

To conclude: There seems to be such an agreeableness of the Qualities or Dispositions of one with the other, that I see no reason why the Facts proceed not from one and the same Cause; for as the inward Surfaces of the Tubes are made smaller and smaller, so the Power of their Attraction (as is visible by the higher

of the Water in them) is greater and greater, and is confirmed by the Experiments of the Air inward ~~and~~ being always inward, and the Life placed nearer and nearer to each other, the Quantity of Space between them becomes less and less, and consequently the Disproportions are increased, whereby the Power of their Attraction is augmented.

EXPERIMENT IV.

This Experiment I take to be very Analogous to those lately made on the seeming spontaneous Ascent of Water between Glass, Marble, and Brass Planes, as also with those made in Capillary Tubes; since it seems to proceed from the same Principle, and subject to the same Laws, as appears by matter of Fact; which take as follows. I took a Glass Tube about 32 Inches long, the Diameter of its Cavity near three quarters of an Inch: This, when I had ty'd a Piece of Linnen Cloth at one end, (to prevent the Ashes from falling out) I proceeded to fill with Ashes at the other: the Ashes were sifted thro' a pretty fine Searse. At every small Portion I put in, I ramm'd them strongly down with a Rammer, whose Basis was very little less than the Bore of the Tube; by which means, I laid, or rather crouded them as close together as possible. When the Tube was become full, I ty'd over that end of it by the Neck a small and limber Bladder, having first exprest all the Air out of it, in order to have that Air, which I expected would be forc'd thro' the Ashes upon the Ascent of the Water. In this manner I plung'd the end of the Tube, to which I had ty'd the Linnen, (as it was,) under the surface of Water in a Glass, and found the Water presently begin to Ascend in it: It arose a pretty pace at first; for in 16 Minutes time it had ascended near an Inch and three quarters: but as it arose higher, so its Progress

Progress became slower; for at the end of a Week the Water had attain'd but to 16 Inches; the Air at the top being near half fill'd with that Air which had deserted the Ashes as the Water ascended in them. At the same time I found the upper part of the Tube, to which the Bladder was ty'd, to be crack'd round, and soon after drop'd off. However I had the Satisfaction desir'd. And so continuing the Experiment, I found at 24 Hours distance from the last Observation, the Water had ascended in the Ashes 6 Inches higher, which was very discernible by the change of Colour it gave them, distinct from those that were dry.

Again, At the like distance of time from the last notice, the Water had arisen 4 Inches and a half, and something better. On the 4th day, at the usual time of Observation, it had ascended 3 Inches higher: and when the following 24 Hours were finish'd, the Water reach'd within half an Inch of the top, by its ascent of 2 Inches. About 10 Hours after, it had compleatly reach'd the Extremity of the Tube. Then desiring to know what Quantity of Water the Ashes had Absorb'd, I weigh'd a Glass of Water nicely, part of which I Pour'd into the Glass, in which the Tube had all along been kept, till it reach'd the Mark the Surface of the Water stood at, when the Tube was first plung'd into it; and found the Quantity to be equal to the weight of 1792 Grains, which is nearly the Bulk of 7 Cubical Inches; the Capacity of the whole Tube, in which it arose, was equal but to about 13 Inches of the same denomination. Now this Experiment to me seems surprising enough from the following Observations.

First, That the Water not only ascended in the Ashes, as between the premention'd Planes, and in the small Tubes, contrary to its Natural Gravation; but with such a Power too, as to force, and put to flight pretty strongly imprison'd Air, which was contain'd in the Interstices of the Ramm'd Ashes.

Secondly, That the removal of this Imprison'd Air could not be doise without a Power surmounting its Resistance, which must be great, since upon endeavouring to force Air thro' the Body of Ashes by the strength of my Breath, when the Tube was not above half fill'd, it prov'd unsuccessful. Not but that I believe, if the same force had been continu'd for some time, it would have found its way through.

That the Water ascends fastest at first, when there is a larger quantity of Interstitial Air to remove, (if I may call it so,) than when the Column of the dry Ashes grows shorter, by the higher Ascent of the Water in them.

Fourthly, That notwithstanding the Tube was rammed as full as it could with Ashes, yet their Interstices were so many, as to receive, or imbibe another Body, equal in bulk to above half the Content of the whole.

Fifthly, That the Water arose, not only in the Ashes adjoyning to the inward Surface of the Tube, but equally in the whole Body of it, as I found upon Examination.

Sixthly, That the Air lodg'd in the Interstices of the Ashes, was protruded thro' them as the Water ascended, was manifest by the Intumescence of the Bladder: And notwithstanding the Accident of the Bladders falling off, I cannot but conclude, that the Quantity of it must be equal to the like bulk of Water which supplied its place.

I repeated the same Experiment in *Vacuo*, in a Tube much about the same Diameter of the other, but not above 10 Inches in length: This Tube, being fill'd with Ashes as before, was plac'd in *Vacuo*, where it remain'd some time, to give liberty for the Air contain'd in them to get away. Then Plunging the lower end of the Tube under some Water, I found (as I expected,) that the Water arose faster in the Ashes in that Medium, than in Common

Common Air ; for in about 4 Hours time, it had reach'd the Extream of its height ; which plainly shews, that the Presence of the Air is so far from being necessary in the Production of this old Phænomenon, that it is a manifest Impediment to it.

A Continuation of Experiments, touching the seeming Spontaneous Ascent of Water, or other Liquids.
By Mr. Fr. Hauksbee, F. R. S.

THE Ascent of Water in Capillary Tubes has been taken notice of some Years ago, but that it should arise between two Glass Planes, whose Sides lie open to the Air, I had not so much as received a hint of it before I first discover'd it. And I find that this *Phænomenon* is not to be ty'd up to Glass Bodies alone ; for Stone, or Brass, and, for ought I know, most other Bodies that have smooth Surfaces, or that their Surfaces may become nearly Contiguous to one another, may give the like Appearance ; as is plain by the following Experiments. I procur'd a pair of Marble Planes, that were Ground as true as the Workman could make them : These when I had joyn'd together dry, without any thing between, I plung'd the Edge of them about a quarter of an Inch under the Surface of the Water, and continued them so for some Minutes of time : then taking them out, I found I could not easily part them without sliding them one from off the other ; which when I had done, 'twas easily discoverable how far the Water had made its way between them, which, upon divers tryals, I have found different ; but at all times, when I had newly rubb'd over the Planes with Wood Ashes, the Water would ascend highest. Now whether the small Dust of the Ashes adhering to the Planes may contribute any thing towards

towards it; or that they better clear them from an Oily or Viscous Matter; that may be communicated to them from our Hand, I cannot yet determine: However, whatever the occasion is, the Matter of Fact is true. Then I took a pair of round Brass Planes, and ordered them as before; the Success of which was very agreeable with the former.

There is one thing I forgot to take notice of in a former Experiment; which is the Ascent of Spirit of Wine, or Oyl of Turpentine between two Glass Planes, without any thing to separate them. It cannot be imagined but that these Planes must touch each other in a multitude of Parts; yet for all that, and notwithstanding they are held forcibly together, the Spirit of Wine will insinuate, and ascend seemingly in an intire Body, between all the contiguous Parts of them, as before and after their Separation nothing appears to the contrary.

To the prementioned Experiments give me leave to add what I have since observed, in plunging the Planes in Spirit of Wine, Oyl of Turpentine, and common Oyl: That all these different Fluids arose between as the tinged Water; only with this difference, the common Oyl very sluggishly; it was near an Hour arising so high between them, as the other Liquids would in less than half a Minute. They all arose in an intire Body from side to side of the Planes, without those Intervals or Spaces, which generally happen on the Ascent of the Water. I likewise took a couple of round Glass Planes, and having laid them one on another, without Paper, or any thing else between to keep them separate; In this manner I plung'd one edge just under the Surface of the tinged Liquor, and found the Water almost Instantly had reach'd the Extreame of them in all Parts: By which we find, that the Water not only ascends directly upwards, but runs sideways; obliquely, or in any direction.

III. *An Account of the Density of Water, touching the different Densities of it at several Degrees, from the greatest degree of Heat to the Freezing Point, observ'd by a Thermometer. By Mr. Fr. Hauksbee, F. R. S.*

I caus'd a Quart of Water to be heated near scalding hot, and then put it into a convenient Glass with my Thermometer, the Spirit in which soon arose into the Ball a-top, where it remain'd till the Water cooling caus'd it to descend : by this time the Spirit in the Thermometer and the Water were become of an equal Temperature ; and when it had descended to 130 Degrees above the Freezing Point, I began my Observations ; which take as follows. I weigh'd a small Bottle in't, and found the Bulk of Water equal to it in that State was 574 Grains. When the Spirit had descended to 80 Degrees above the Freezing Point, the Bulk of Water equal to the Bottle then weigh'd three quarters of a Grain more than before. At thirty Degrees above the Freezing Point, the quantity of Water equal to the Bulk of the Bottle was again increased about three quarters of a Grain. At the Freezing Point, it weigh'd still something more ; in all about two Grains from 130 Degrees above the Freezing Point, to that very Point. Which to me seems considerable, and ought to be taken notice of by such Gentlemen, who judge of a Mineral or any other Water by its weight, when they have not an opportunity of making the Experiment at the Fountain-head ; for there I suppose the Water is at the same Degree of Temperature at all Seasons.

Now

Now according to this Experiment, I find, that Water is condensable by Cold one 28th part of the Whole, from the greatest Degree of Heat in this Climate. Supposing then, that the Water in the Sea should suffer the same Alterations by the change of the different Seasons, (as I see no reason but very nearly it must) it would be easy to compute, that a Ship which should draw two Fathoms, or 12 Feet Water, in such Weather as is understood by the greatest Degree of Heat, would draw about half an Inch less from the greater Density of the Fluid, when reduc'd to the premention'd Degree of Cold; and consequently wou'd Sail better at that time.

But this is not all that occasion'd the making this Experiment, for I did it in order to another. And since I find that Water is capable of Dilation and Contraction by Heat and Cold, I see no reason why the same may not be performed by force, notwithstanding the many Attempts to determine it have as yet been fruitless. For since the constituent Parts of the Fluid, are capable of being remov'd at greater Distances one from the other by Heat, and become more closely united by Cold; so I conclude, that there must be some Body contained in't of an Elastick Quality, which (I think) must be subject to the same Laws of such a Body; that is, be capable of Compression by force, as well as to become more Dense by Cold. But the Issue of this, I must leave to a more proper Season.

IV. *An Account of some Experiments, in relation to the Weight of Common Water, under different Circumstances.* By Mr. Fr. Hauksbee. F. R. S.

First, I took a Glass of Common Water, and having weigh'd nicely a Glass-Bottle in it, whose Bulk was equal to the Bulk of 575 Grains of the same Fluid, then I caus'd some of the same Water to be boyl'd over the Fire; and after that, it was included in *Vacuo*, and there remain'd till it became of the same Temperature (as to coldness) with Common Water. Thus, to the utmost of my Power, I endeavour'd to Extricate all the Air out of the Water, thinking in that State, it would become more dense than when I weigh'd my Bottle first in't; but contrary to my Expectation, I found that the Bottle had just the same weight in it as before; which seems to confirm the impossibility to compress Water by force into a lesser space than it naturally possesses: For if upon the Removal of such a Quantity of Air from out of its Body, the Parts do not slide any closer together, how should a Weight laid upon its Surface, when its Interstices seem to be repleat with Air, make any Impression on it? The Body which is forc'd out of the Water, by the premention'd means, I call Air; since for any thing to the contrary that I can discover, it is subject to all the same Laws with it; but that the Water, upon its absence, should, not unite more closely than before, seems very surprizing to me; for I cannot conceive what Matter must supply the Vacancies, since the Particles of Water themselves remain at the same distances as if the Air was not withdrawn, otherwise the Water

of necessity must become more dense. But to proceed ; I caus'd some Water to be heated about Blood-worm, when weighing my Bottle in it, I found the bulk of Water equal to the bulk of the Bottle was about 3 Grains less than when Cold ; which shows, that the component Parts of the Water are easily separated by Heat, and the Matter lodg'd in its Interstices capable of dilation. Then I took that Water that I had purg'd of all its Air, (as near as I could,) and gave it a degree of Heat, not exceeding luke-warm ; upon weighing the premention'd Bottle in it, I found, that altho' the Heat it had received was very inconsiderable, yet the bulk of the Water, in that State, equal to that of the Bottle, was now diminish'd 2 Grains: which plainly shews, that notwithstanding the Water contain'd no Air that I could discover, yet there seems a Matter latent in it, capable of Intumescence.

V. *Epistola D. Gundonis Græci, Societatis Regalis Londin. Socii, ad Illust. Comitem D. Laurentium Magalotti, dictæ Societatis Socium, De Natura & Proprietatibus Soni.*

Clarissimo Viro Laurentio Magalotti
Guido Grandus S.

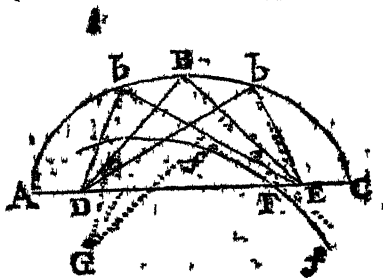
Elegantissimum Præfulis Armaçian^{is} commentarium de Sono, quod mihi nuper communicasti, summâ animi voluptate perlegi ; at circa Semiplani figuram in calce ejus scripti commemoratam, in cujus potissimum expositione meam à te operam desiderari signific-

ficaveras (five ob argumenti ipsius difficultatem, ingenii mei viribus longè superiorem, five ob diagrammatis Londino transmissi, minùs fortassè ad impressum exemplar exactam delineationem) vereor, ut satis assequi mentem Auctoris, tuisque votis pro merito respondere valuerim. Ne tamen iussis tuis nihil interim videar detulisse, qualescumque animadversiones, & conjecturas meas ad propositi nodi evolutionem spectantes aperiam, & sin minus Interpretis, saltem Divinatoris personam hac in re suscipere non gravabor, ut eorum quæ ad implendam muneris injuncti provinciam pertinerent, nihil à me fuisse, tuæ auctoritatis gratia, prætermissum intelligas.

Comparat doctissimus Præsul scientiam auditus cum Theoria visionis, atque ut hæc in directam, reflexam, & refractam dividitur, ita illam pari ratione trifariam distribuit, ut non modo sonos directos, & reflexos (quod dudum in usu fuit) sed & refractos consideret; quemadmodum autem eximiis inventis opticis, catoptricis, & dioptricis visionem à majoribus nostris magnâ jam ex parte perfectam fuisse animadvertit, ita compluribus instrumentis Acusticis, Catacusticis, & Diacusticis, five Phonicis, Cataphonicis, & Diaphonicis (utrovís enim modo denominat) auditum, tam ex objecti, quam mediâ, vel organi parte perfici posse non dubitat, eoque spectantia problemata proponit, quæ tamen in hoc scripto, nedum absque demonstratione, sed & absque determinatione, aut constructione ullâ exhibentur, unde non major ad ipsorum solutionem lux nobis affulget, quam quæ, ante inventa à M. Galilæo scientiæ motus principia, haberi potuissent ad erodationem problematum circa determinandam projectorum semitam, vel aquarum ex datâ altitudine descendendum velocitatem propositorum: Neque enim affirmare verebor, perinde ignota nunc esse Acusticæ doctrinæ fundamenta, certè nondum passim vulgata, aut inter eruditos recepta, licet fortassè

laudatissimo huic Præfuli innotuisse videantur, si quæ ab illo indicata, & promissa sunt, attendamus, quorum quidam uberiori expositione, atque apertâ demonstratione totam sibi literariam Rempubicam demeruisset, cum vix credendum sit, omnes simplici illâ Opticorum, & Acusticorum comparatione fore contentos, quæ vix ultra satis latam analogiam extenditur, ob tot discrimina, quibus propagatio Lucis à diffusione Soni secernitur: inter quæ illud palmarium est, quod Lux per lineam rectam semper exporrigitur, dum sonus etiam per curvas, & inflexas utcunque semitas quaquaversum spargitur, atque, intercepto cujusvis opaci corporis obice, sensibilis red- datur.

Et vero hæc ipsa, quæ de Soni diffusionem doctissimus Auctor noster edisserit, ejus differentiam à lucis propaga- tione manifestant: docet siquidem, sonum fecus parietes, aut fornices lævigatissimos, ellipticâ, vel cycloidalis, po- tius quàm circulari flexurâ donatos, blando quodam, & expeditissimo lapsu feliciter excurrere, nec non per mol- lem aquæ superficiem, sonoris tremoribus, quibus ac- crispat, obsequentem validius promoveri: quæ vereor, ut in luminis propagatione adeo generatim obli- ventur; nam de Ellipsi quidem hoc tantum habemus ex catoptri- câ demonstratum, quod radii lucis ex altero ejus foco D

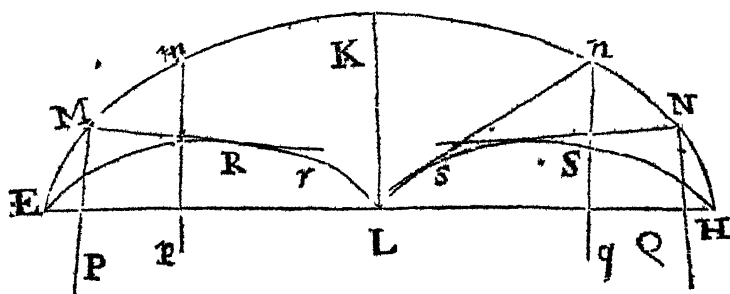


emanantes, & in ellipti- cam curvam A B C im- pingentes, inde reflexi in altero foco E colliguntur; at si ex alio quovis puncto G, præter focos, exeant radii, non omnes amplius in unum punctum coi- bunt, sed ita reflectentur,

ut curvam causticam f F f contactu suo efforment, su- pra cujus convexitatem existentes uno aut altero reflexo radio, non pluribus gaudere poterunt, in ipsâ vero cur-
vâ

vā positi aliquot ex maximè vicinis participabunt; at qui intra cavitatem ejusdem versabuntur, ab omni reflexorum radiorum illapsu immunes erunt, adeo nullum inde sibi emolumentum obventurum sperabunt.

Cycloidem quod attinet, ostendit quidem Cl. V. Joannes Bernoullius in Actis Lipsiæ 1697. Lucis radium, si per media transiret, quorum raritates in quolibet puncto juxta rationem subduplicatam altitudinum variarent, ita continuo flexu refrangendum, ut in curvam cycloidis sinuaretur: at seu reflexione, seu directâ per idem medium propulsione, quid figura cycloidis ad feliciorē lu-



minis diffusionem conferret, planè non video; hæc enim curva focus omnino caret, adeò ut in nullo puncto radios recolligere possit, sed in curvas irregulares abeunt radii ab ipsa reflexi, nisi quòd ubi ad axem K L parallelè radii P M, Q N in Cycloidem E M K N H inciderent, tunc linea caustica per contactum reflexorum radiorum M R, N S, efformata, ex binis cycloidibus E R L, H S L, circulo subduplæ diametri generatis, componeretur, radiosque reflexos confertissimos circa utriusque confinium L, ad medium basis reflectentis cycloidis exhiberet: cæterum tam in his quàm in aliis causticis ex qualibet luminosi puncti radiorumque positione resultantibus, eadem observationes locum haberent, quas sub finem præcedentis paragraphi causticis per ellipsim efformatis competere diximus.

De planâ aquarum superficie nihil est quod addam, cum pateat, lucis radios per illam aut omnino refractos transire, aut ordinatâ reflexione in adversam partem remitti, perinde ac è chrystalli solidioris superficie, imò ab hac aliquantò fortius, quam ab illâ, tantum abest, ut per illam facillimè repentes in directum expeditius promoveri possint, illumque blandum progressum obtinere, quem tremoribus harmonicis, per mollem aquarum superficiem, crispatione suâ ipsorum flexui se accommodantem serpentibus Auctor tribuit: immò & dubitare licet, an lævigatissimæ speculorum superficies, perindè ac luminis, sic soni reflexionibus valdè conducerent, cum Echo ipsa speluncarum recessus asperissimos, magis quàm politos, ac tenui gypso incrustatos parietes habitare videatur, ab incultis vallibus, ab anfractuosis antris, atque è veterum ædificiorum ruderibus frequentius respondens; quocirca Poeta Mythologus Metamorphos. lib. 3. fab. 5. de illâ sic cecinit:

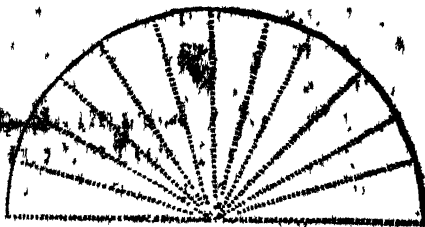
*Spreta latet Sylvis: pudibundaque frontibus ora
Protegit, & solis ex illo vivit in antris.*

*Vox manet, ossa ferunt lapideæ, & sic frigida saxa
Inde latet Sylvis, nulloque in monte recondit,
Omnibus auditur: Somnus est qui vivit in illis.*

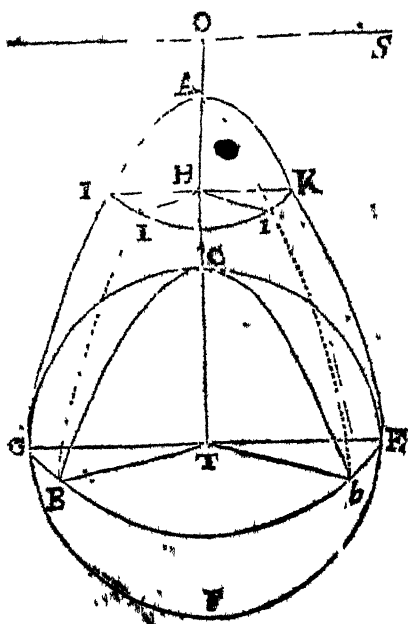
Quæ tamen non ideo à me dicta velim, ut quidpiam aut debita fidei, aut promerita laudis derogem pronuncians. Cuius Auctoris, quem potius extimulandum censeo ad hæc sonorum theoriæ ex integro edendam, aut, si quid amplius, & absolutius, iusto volumine jam ediderit, nobiscum communicandum: ut quâ tandem lege sonorum tremores per aerem, per aquam, & per varæ densitatis corpora qualibet, tum fluida, tum solida progrediantur, & in quo soni, lucisque convenientia nondum satis hætenus nobis comperta consistat, innotescere possit, unde firmatis Acusticæ fundamentis mirum in modum scientia

tia hæc deinceps perficeretur, idoneis organis ad sonum congregandum, augendum, promovendum, multiplicandum, aptiusque discernendum excogitatis, quorum in hoc scripto spem facit, & desiderium accendit Præsul doctissimus. Interim ego ostensurus, quantum illius verbis deferendum existimem, Acusticum ipsum, seu spheram Phonicam ab eodem propositam, divinando magis, quam interpretando, exponere utcunque aggrediar, verbis illius primùm adductis, ut cum meis conjecturis mox subsistendi conferri queant, & quàm exactè iisdem respondeant cujuslibet possit arbitrio judicari.

Addam hoc loco, inquit Auctor, *Semiplani Acustici, seu Spheræ Phonica figuram, quasitentamen ad magnum scientiæ hujus principium explicandum, quod in sonorum progressionem consistit. Consideretis oportet rude hoc semiplanum velut horizonti parallelum, nam si eilem perpendicularare fuerit, suppono extremitatem illius superiorem non amplius circula-rem futuram, sed hyperbolicam, partem vero inferiorem equallem fore uni ex maximis terræ circularibus: adeo ut universa sphaera Phonica, si ita appellare liceat, sit quædam hyperbola solida, super concava basis spherica superficie erecta.* Porro Diagramma Londinense transmissum. hujusmodi erat, nullis præterea notis ad ejus illustrationem facientibus instructum.



Ipsæ igitur, hoc alio Schemate substituto, mentem Auctoris aperire satagam. Sit terræ globus $C G F E$, atque in puncto C ejus superficie sonus aliquis excitetur. Hic per terram ipsam nec non per aerem circum-
quaque propagabitur, adeo ut quo tempore ad maximum terræ circulum polo C descriptum, nempe ad Peripheriam $G B E$ aut seipsa (sicet fortasse insensibiliter) perve-
nit,



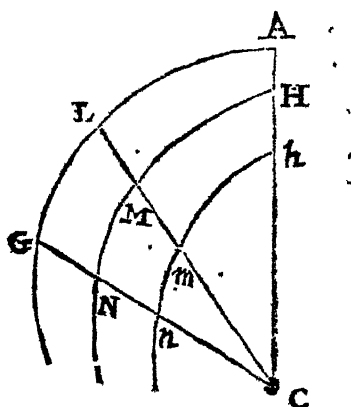
nit, aut saltem (si validior esset) perveniret, per aerem diffusus, quoddam spatium replet, pro variâ transitus facilitate, non prorsus sphericè, sed inæqualiter exporrectum, & à perimetro hyperbolæ GLAKE, circa axem CAO sonoro corpori C perpendicularem positæ, circumscriptum: imo vero à superficie conoidis hyperbolæ, quam hyperbola ALG circa suum axem rotatæ generat, definitum. Itaque universa sphaera phonica, per quam dato tempore sonus

extenditur, erit solidum spatium comprehensum ab hyperbolica conoide GAE, & quæ maximo terre circulo GBE infusa, & sonantibus sphaericæ hemisphaerica GCEB inferius terminatur: quæ quævis in spatio plano ad horizontem parallelo ubilibet secta, exhibebit semicirculum LIK, qualem ostendit Auctoris figura, quem & semiplanum appellat, eo quod ipsius diagrammatis prospectus alteram solum medietatem ejus exhibet. Reliqua trans hyperbolam verticalem (quæ & non obliquè spectanti per axem binariam secatur) inconspicua manente. Verum quæ sit hujusmodi hyperbolæ species, aut quibus principiis doctrina hæc fulciatur, nec Auctor indicat, nec mihi suppetit unde hæc de re quidpiam certi conjiciam.

Quod unum superest, adnitar, ut inverso vestigandi ordine procedens, detegam primò per quod linearum genus tremores sonores diffundi oporteret, ut in ejusmodi hyper-

hyperbolam dato tempore expanderentur ; secundò, quæ raritatis variatio foret in variis aeris altitudinibus supponenda, ut (stante refractionis communi lege, qualem radii lucis observant) sonorum directiones juxta inventam linearum speciem flectere posset ; ac tertio, quæ vicissim dicenda sit lex refractionis, quam sonori tremores in ejusmodi curvarum genus abeuntes sequuntur ; suppositâ raritatis aeris variatione tali, qualem plerique Philosophorum, & Mathematicorum in illo agnoscunt juxta reciprocam rationem ponderis atmosphæræ incumbents, & inferiores partes gravantis, quam experimentis congruere testantur.

Pro quo consideremus, corpus sonorum C tremores suos per directiones C n, C m, C h, quaquaversus communicare, aut certè juxta eas lineas, per quas impulsus fuerat, se restituendo repellere aerem, eundemque frequentissimis oscillationibus protrudere, quibus crispatur, atque ad motum tremulum juxta easdem directiones diffusum sollicitatur ;



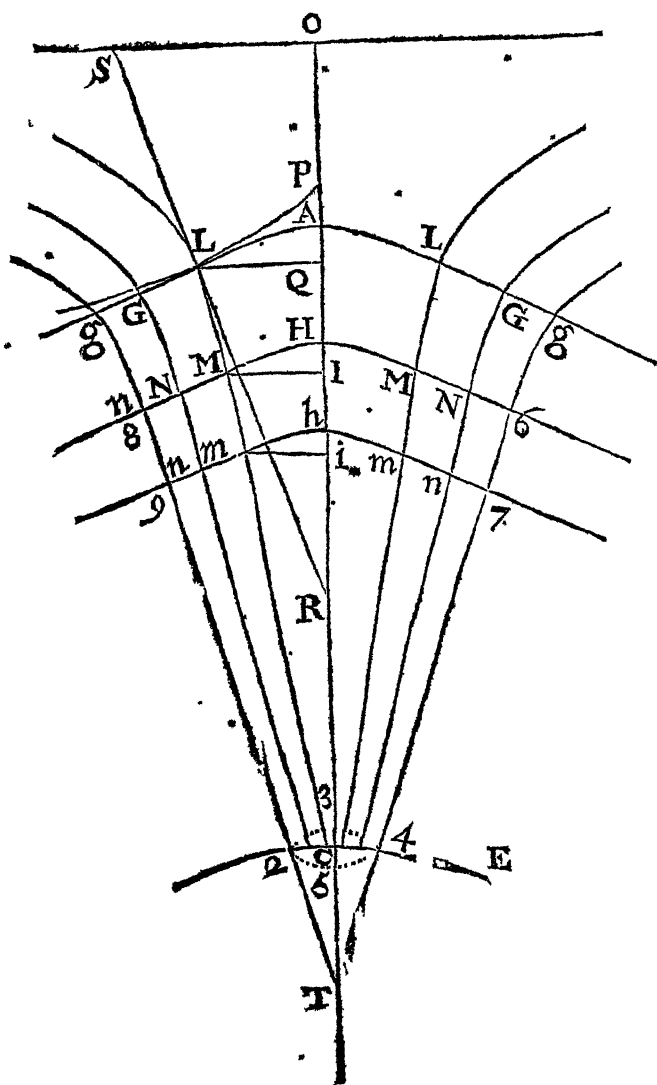
hi ergo tremores quodam minimo tempore pervenisse concipiantur ad puncta n, m, h , unde iter suum prosequentes, successivè, post aliud datum tempus simul propagabuntur, primus ad punctum N, secundus ad M, tertius ad H ; iterumque post aliud datum tempus simul progredientur, prior ad G, alter ad L, postremus ad A. Nunc igitur lineas quidem C n N G, C m M L, C h H A, per quas quilibet tremor successivè diffunditur, voco *Radios sonoros* ; lineas vero n, m, h, NMH, GLA , quas prædicti sonori radii, omnesque alii synchroni iis intermediis dato quolibet tempore simul attingunt, *Undas sonoras* appello.

Et quidem in medio prorsus ubi libet uniformi, cessante causa, quæ tremores sonoros a sua directione in hanc, vel illam partem deflectere cogat, patet sonoros radios semper rectos procedere, seu per viam brevissimam ab uno ad alium terminum directè progredi, atque undas penitus circulares sonoro corpori concentricas efficere, quia cum non majorem hîc, quàm alibi transitus difficultatem inveniant, utique ad pares distantias singuli dato quovis tempore elongabuntur: Secabit autem radius quilibet undam suam perpendiculariter, atque undæ quælibet concentricæ, & similes erunt, ut constat ex elementis.

At in medio difformis densitatis, velut in aere terræ circumfuso, qui diversam pro variâ altitudine (nam caloris, frigoris, humiditatis, & siccitatis vices, quæ ad certam legem revocari non possunt, pro nunc seponimus) raritatem obtinet, solus radius $CH A$ perpendiculariter trajiciens omnes aereas lamellas, sive superficies terræ concentricas, irrefractus transibit, ac rectus manebit; cæteri vero iisdem superficiebus obliquè impingentes, continuo quodam flexu in quolibet puncto refringentur, & in curvas $C m M L$, $C n N G$ sinuabuntur; nec non pro variâ transitus facilitate non ad eandem ubivis distantiam dato tempore progredientur, quare puncta A, L, G , aut H, M, N , quæ eodem momento sonus per quoslibet radios emissus attingit, inæqualiter à sonoro C remota erunt, adeòque undæ $A L G$, $H M N$, $h m n$, omnino circuli non erunt corpori sonoro concentrici, sed alterius generis curvæ, quas tamen oportet invicem similes esse, ac similiter positas: quare in hypothese nostri Auctoris, qui extremam illam undam $A L G$, ultimos globi terræque fines lambentem hyperbolicam voluit, necesse est quasvis alias undas intermedias $H M N$, $h m n$, esse hyperbolas similes, ac similiter positas, diversis quidem verticibus A, H , h , sed eodem centro, ad eundem axem, & sub similibus laterum figuris descriptas; nam quæ-

quæcumque sit ratio, quæ ostendat, ob simultaneum appulsum soni ad puncta A, L, G , per vias synchronas $CH A$, CML , CNG , unde ALG facefcere in curvam talis speciei (puta hyperbolicam): eadem prioris iisdem fundamentis evincet, ob simultaneum appulsum soni etiam ad puncta H, M, N , per synchronas lineas $Ch H$, $Cm M$, $Cn N$, undam HMN , in curvam ejusdem speciei (nempe hoc casu in hyperbolam similem, ac similiter positam) pariter abire, ut de se constat. Nec dubium insuper, sonoros radios CHA , CML , CNG , semper undas illas similes ALG , HMN , hmn debere perpendiculariter, sive ad rectos angulos secare, ut in circularibus undis contingit; quod cum in simili proposito de lucidis undis ostenderit jam Vir Cl. Christianis Hugenius, pag. 44. tractatus sui de Lumine Gallicè editi, non est cur in hac observatione pluribus momentis confirmandâ tempus teratur.

Itaque investigatio viæ, per quam radî sonori, juxta hypothesim Auctoris nostri, propagantur, ad hoc pure geometricum Problema reducit, ut inquiratur natura curvarum, quælibet hyperbolas similes, & circa eundem axem, eodem centro similiter descriptas, perpendiculariter secantium. Sint hyperbolæ similes ALG , HMN , hmn , aliæque innumeræ intermediæ, aut supra, vel infra ipsas similiter positæ, idem commune centrum O habentes, eodemque axe $OA'H$, cui alter OS coniugatur, descriptæ: ducenda est per punctum C curva $Cm ML$, aut $Cn NG$, propositas omnes hyperbolas perpendiculariter secans. Describatur per datum punctum C , inter asymptotos OA , OS hyperbola $Cm ML$ talis naturæ, ut positâ ratione transversî lateris priorum hyperbolarum AL, HM , &c. ad latus rectum earundem æquali rationi t ad r , potestates ordinatarum LQ denominatæ ab exponente r sint reciprocè proportionales potestatibus abscissarum à centro OQ denominatis ab exponente t , nempe facta $OQ = x$, & $QL = y$, ita



ut $y^r = \frac{1}{x^2}$; five, ducta qualibet alla ordinata m ,
 M I, ita ut ratio distantiarum à centro O Q, O I fit re-
 ciproce tam multiplicata rationis applicatarum I M, Q L,
 quam

quam multiplex est fractio $\frac{r}{t}$ unitatis. Dico hanc satisfacere quæsito; ducta enim cuiusvis hyperbæ $A L$ tangente $L P$ in puncto, ubi à curva $C M L$ secatur, nec non $S L R$ tangente ipsius hyperbolæ $C M L$ in eodem puncto, patet ex his quæ in Theorematum Huguenianorum demonstratione, cap. 7. n. 9. ostendimus, fore $O Q$ ad $Q R$, ut exponens potestatis distantiarum $O Q$ ad exponentem potestatis ordinarum $Q L$, nempe ut t ad r ; sed ut t ad r , nempe ut transversum latus ad rectum, ita per 37. l. Conic. est rectangulum $O Q P$ ad quadratum $Q L$; igitur ut $O Q$ ad $Q R$, siue sumptâ communi altitudine $Q P$, ut rectangulum $O Q P$ ad rectangulum $P Q R$, ita rectangulum $O Q P$ ad quadratum $Q L$, quod ideo æquabitur rectangulo $P Q R$; quare angulus $P L R$ rectus erit: unde curva $C M L$ perpendiculariter occurreret in puncto L hyperbolæ $A L G$, eodemque modo aliis hyperbolis $H M N$, $h m n$, in punctis M, m , in quibus illas secat, perpendicularis esse ostendetur; quod erat, &c.

Hinc primò colligitur, quòd si hyperbola determinans spheram Phonicam Auctoris nostri, nempe $A L G$, aliæque similes concentricæ $H M N$, $h m n$, fuerint æquilatæræ, tunc propter æqualitatem laterum t , & r , hyperbola $C M L$ erit & ipsa hyperbola Apolloniana, & quidem pariter æquilatera, ejus enim æquatio superiùs allata transformabitur in hanc $y = \frac{1}{x}$ ubi ratio ordinarum

simpliciter reciproca erit rationis distantiarum à centro; itaque radii pariter sonori æquè ac sonoræ undæ, juxta hanc hypothesin forent hyperbolæ ejusdem speciei, diversâ duntaxat positione collocatæ: Memini porro Illustrissimum Equitem Isaacum Newtonum Opticæ sur, lib. 3. p. 287. Observ. 10. ostendere, quòd & radii lucis trans duorum cultorum acies in obscurum cubiculum admissos, in hyperbolicas fimbrias, qualis esset $C M L$,
pariter

pariter sinuari, cujus phenomeni si ratio physica afferri posset, eadem hyperbolicos pariter soni radios, quales Armachani Præfulus systema invehere videtur, fortasse persuaderet.

Secundò observandum est, quòd si plures ejusmodi curvæ, seu radii hyperbolici m ML, n NG, &c. secantes undas hyperbolicas ALG, HMN, &c. perpendiculariter, describantur, non in unum exactè punctum C poterunt convenire, tametsi propius, & propius cœant ad partes C, atque ad intervallum pervenire possint, minus quolibet dato intervallo; quare concipiendi erunt radii illi hyperbolici à corpusculo C alicujus extensionis procedere, non ab aliquo mathematico puncto, quod ipsum convenientissimum est; sonus enim ex collisione corporum nascitur, non ex unius rigurosi puncti, seu termini extensionis tremore produci potest.

Imò cum omnes undæ à sonoro corpore propagatæ esse debeant, ut supra vidimus, hyperbolæ similes, congruum est, ut concipiamus, corpus sonorum C quasi fibrillam minutissimam frequentissimè oscillantem, cujus minima, & veluti initialis unda infinite propomodum exigua 234, & ipsa reverà hyperbolica sit, seu potius apex physicus alicujus hyperbolæ; ita ut nimirum fibrilla oscillatoria corporis sonori C, dum pulsatur, ex situ directo 2 C 4 detrusa in situm concavum 2 5 4, vi percussione adigatur, tum vehementissimi elateris sui, nec non propriæ tensionis vi, restituta in convexam hyperbolam 234 intumescat, ac rursus reducta alternis vibrationibus fluctuans hinc inde suos tremores in hyperbolicas undas, ipsimet initialibus 2 3 4, 2 5 4 perpetuò similes, sursum, ac deorsum suapte naturâ, & in medio utrinque libero expandat, sed obice terrestris globi C E (cuius centrum T) impedita fortasse, hyperbolicas undas suas dumtaxat sursum propaget, & Phonicam Spheram ab Auctore nostro excogitatam describat, hemispherio terrestri ab inferiori parte interruptum, ac definitam. Quòd si vera esset

est. Hæc prædictæ doctrina Artic. 81. suæ staticæ proposita, quæ in chordæ extensæ reipsâ hyperbolicam figuram, quælis est 2 5 4, cujus centrum sit idem quod centrum terræ, vi proprii ponderis assumant, nemo non videt eam ipsam confirmando Auctoris nostri systemati fore congruentissimam, hinc enim ratio haberetur, cur fibrilla quævis sonori corporis C, dum ad vibrationes harmonicas sollicitatur, in hyperbolam 2 5 4 excurreret centrum habens in centro terræ T, similiterque in aliam æqualem 2 3 4 assurgeret, indeque per alias ampliores hyperbolas tremorem diffunderet, quarum omnium centrum esset O æquè distans à sonoro corpore C, ac sonorum corpus illud remotum sit ab ipsomet centro terræ; quare distantia CO æqualis semidiametro Globi Terraquei limitem definiret, ultra quàm nulla sonora unda propagaretur, nullusque posset sonus audiri, & linea OS, utpotè asymptotus quorumvis hyperbolicorum radiorum, per quos deferitur sonus, confinium beatæ illius regionis constitueret, in quâ ab omni terrenarum rerum strepitu securis in summâ tranquillitate philosophari liceret.

Porro ne quis speculationem hanc eo nomine contemnendam putet, quod fibrilla quævis sonori corporis, cum brevissima sit, ac validè distenta, semper in situ recto 2 C 4. manere videatur, nec posse in concavas, aut convexas hyperbolas 2 5 4, 2 3 4 sinuari, considerandum insuper est, hyperbolas quò majoribus axibus præditæ fuerint, eo magis ampliari, & ad lineam rectam accedere; itaque ob ingentem distantiam centrorum T, vel O, sicut lineæ quas gravia cadentia describunt, licet in centrum T collimantes pro parallelis habentur, & arcus circuli horizontalis cum rectâ ejus tangente confunditur, ita & initiales illas hyperbolas 2 5 4, 2 3 4 fermè coincidere dicendæ sunt cum rectâ 2 C 4, unde sensibilis non est incurvatio fibrillarum oscillantium in sonoro corpore, nec se prodit undarum hyperbolicarum species, nisi ubi in amplius spatium G L A L G dilatatæ fuerint centro suo propriis accedentes.

Animadvertendum adhuc tamen, his principiis positis, consequens fore, ut sonus hinc inde ad latera non excurreret ultra spatium ab hyperbolicis extremis radiis 2 9 8 g, 4 7 6 g comprehensum, quas tangerent rectè T 2, T 4, à centro terræ per terminos fibræ oscillantis aductæ; ac reverâ fibræ illius tremores juxta aliam directionem non procederent, quam per T 2, T 3, T 4, aliasque intermedias angulo 2 T 4 comprehensas, singulis particulis fibræ ejusdem correspondentes, itaque spatium extra dictas hyperbolas 2 9 8 g, 4 7 6 g positum ab omni tremore harmonico vacaret, nec posset juxta sensum Auctoris phonica sphaera ad integrum terræ hemispherium exporrigi; itaque oportet, nunquam reipsâ unicam aliquam sonori corporis fibrillam tremere, quin terminos aliarum fibrarum, quibus connectitur, & inter quos distenditur, eo ipso trahat, & ad harmonicum tremorem pariter sollicitet, quæ rursus alias, quibus implicantur, abducunt, & ad tremorem, excitulant, quemadmodum tensa chorda musica ligneo instrumento, cui alligatur, tremores suos evidenter communicat; itaque harmonicæ oscillationes in alia corpora, quibus mediâtè, vel immediâtè connectitur, percussâ fibrâ sonori corporis, subindè transfunduntur, licet magis magisque semper debilitatæ, ac demum insensibiles redditæ per hemispherii terrestris superficiem sparguntur, & longius ac longius serpentes obrepunt (quod auris ipsa terræ applicata, & magnos saltè fragores in maximâ distantia excitatos discernens testari potest) itaque ex aliis etiam locis emergunt alii sonori radii hyperbolici per totum terræ hemispherium, à quibus Phonica sphaera Præsulis Armachani satis impleri possit.

Vides, Vir Illustrissime, quàm me ex inopinato procul abduxerit dulcissima hæc contemplatio; sed parcior ero in duobus reliquis problematibus à me supra propositis, nostramque adhuc operam desiderantibus, prosequendis; conabor autem secundam quæstionem genera

tam curvam FfF exprimere suis ordinatis FQ , $f q$ raritates medii in variis ejus altitudinibus ; nam quia CP est parallela ipsi RN , erit angulus PCB æqualis angulo, quem radius refractus Nn in puncto N efficit cum perpendicularo ; & ideo BP , five FQ erit semper sinus refractionis, posito CP sinu toto ; quare cum supposita sit lex ea refractionis, ut sinus ejusdem proportionalis sit raritati medii ; utique eadem FQ exprimet medii raritatem ad altitudinem Q , five ad æquæ altum punctum N , per quod radius transit. Quod erat, &c.

• In nostro autem proposito, ubi $QN = \frac{1}{X^{\frac{t}{r}}}$ propter
 $\bar{Y} = \frac{1}{X^t}$, si FQ exponens raritatem aeris vocetur Z ,
 erit $Z = \sqrt[t]{\frac{t}{X^{2r+2s} + t t}}$; aut sumpta etiam r , & CP
 pro unitate, fiet $Z = \sqrt[t]{\frac{t}{X^{2+2s} + t t}}$; atque in casu ;
 quod unda hyperbolica fuerit æquilatera, adeoque & ra-
 dius hyperbola similis æquilatera, $y = \frac{l}{X}$, propter $t = 1$,
 fiet $Z = \sqrt[t]{\frac{1}{X^4}}$

Quoniam vero tum Jacobus Hermannus in Actis
 Lipsiæ 1706, tum David Gregorius Astronom. lib. 5.
 ostendunt Curvam, quæ determinat gradus raritatum
 aeris esse logarithmicam, adeo ut altitudines OQ , $o q$,
 five

five X sint logarithmi numerorum exponentium aeris raritates in punctis Q, q : patet radii continuè refracti Nn , NG curvaturam ea lege procedere, ut sinus complementi incidentiæ, & refractionis ad potestatem

$r + \frac{1}{r}$, elevati rationem habeant compositam ex ratione sinuum rectorum ad similem potestatem evektorum, & ex ratione quam habent logarithmi raritatum.

Cæterum etsi consenserim, ordinariam legem refractionis lucis dare sinus incidentiæ, & refractionis proportionales raritatibus mediorum, non dissimulo tamen id fortassè non adeo exactum esse, cùm ratio sinuum in refractione ex aere in vitrum sit circiter sesquialtera, aer vero plusquàm millies vitro sit rarior; sed cum viderent Geometræ majorem fieri sinum refractionis in transitu ad aliud medium pro majori facilitate quâ illud lux penetrat in communi hypothesi, vel pro majori difficultate juxta Cartesium, qui supponit è contrario lucem magis refringi ob majorem difficultatem in rariori medio quàm in densiori (ut gravia corpora ob majorem difficultatem penetrandi densiora corpora, in his magis refringuntur, resiliendo à perpendiculari) & utramque legem in eo convenire, quod pro majori medii raritate, major fieret refractionis: hinc invaluit, ut sinus proportionales dicerentur, non quidem facilitati, aut difficultati transitus, quarum alterutra ab aliis in dubium vocatur, sed raritati medii, in quâ omnes conveniunt, licèt vera proportio illi non prorsus respondeat in eadem geometricâ ratione; itaque ubicunque raritatis mentio facta est, subroganda est fortassè facilitas transitus in communi, & difficultas in Carthesiana hypothesi, præterquàm ubi diximus, raritatem ex pondere aeris incumbentis variatam respondere altitudinibus ut

numeri logarithmis suis respondent ; hoc enim exactè verissimum est.

Hæc sunt, Vir Illustrissime, quæ, te iubente, notanda censui circa doctrinam acusticam, & Semiplanum à Cl. V. Armachano Præsule propositum ; quæ quidem diligentius expendi, atque accuratius explicari debuerant, sed variis subinde curis distrahentibus, non nisi per intervalla contemplationi harum rerum vacare licuit ; itaque meæ erga Amplitudinem tuam observantiæ argumento hoc qualicumque contentus eris, mihi que tuæ humanitatis officia impendere pergens, aliis jussibus tuis paratissimum semper invenies. Vale.

Florentiæ, 24 Maii,
1708.

VI. *Part of a Letter from Mr. Ralph Thoresby, F. R. S. to Dr. Hans Sloane, Reg. Soc. Secr. concerning some Roman Antiquities found in Yorkshire; and a Storm of Thunder, Lightning, and Rain, that happen'd there, August 5, 1708.*

Leeds, September 18, 1708:

Honoured Sir,

IF there had been any legible Inscriptions upon any of the three *Roman Monuments* sent me some Months ago from our *Adellocum*, you had then heard from me: One of these has been evidently an Altar, having the *Discus* or *Hearth* very plain upon the top; another I desire your Opinion of, for tho' it be made strictly in the form of an Altar in all other respects, it wants the *Discus* or *Lanx* upon the top, and I have never yet seen any Altar without one, and it seems too small, (being but eighteen Inches high and six broad,) for a *Commemorative Monument*; the three Rolls, or Wreaths upon the top are so entire, that it is plain there never was any thing else wrought upon it: Now whether any of the *Roman Arae*, or *Altaria*, were made without a *Discus* or *Hearth*, is what I desire to know.

The more immediate occasion of this is to acquaint you with some of the effects of a late *Storm of Thunder, Lightning, and violent Rain*, which happened the 5th day of the last Month. I was then at the *Spaw at Harrow-gate*, near *Knaresbrough*; where having a spacious View upon the open Forrest, I observed the Motion of the

the Clouds and Storm, which began in the West, wheel'd about by the North and East to the South: When the Night drew on, the Lightning must of necessity appear more dreadful. The Intermiſſion betwixt the Flaſhes was very ſmall; the Claps of Thunder were ſo very loud, and the Lightning ſometimes ſo continued, that Perſons were generally apprehenſive of ſome damage, tho' the more ſurprizing effect of the Storm was by the Rain, as will appear by the Sequel. But firſt as to the Lightning; It burnt down a Barn near *Scarborough*: but I ſhall confine my ſelf to thoſe Parts where I was, which I have attested under the Miniſter's Hand Mr. *Thomas Furnis* of *Bewerly* near *Pately-Bridge*, about ſix Miles from *Ripley*; who writes, that *Thomas Horner*, with others, flying from the violence of the Rain, which ſeem'd rather to fall in *Spouts* than Drops, took ſhelter in a neighbouring Barn; whence, after ſeveral frightful Thunder-claps, they were expell'd by the Bolt, as they term'd it, but really the Lightning, which ſinged the Hair of the ſaid *Thomas Horner*, blew another Man backward who was climbing up the Hay-Mow, left a Sulphurous ſtench behind it, and in the concluſion, burnt the Barn and Hay. As to the *Inundation* it was ſurprizing; it tore up much of the Road and Street from the Church to the Bridge, and made Pits, in ſome places ſeveral Yards deep, threw down part of a Barn and a Stable, both of them lately built, it push'd into moſt of the Houſes in the Town; the Water, in ſome, was as high as the Soles of the Windows, and block'd up the Door of one Houſe with Gravel almoſt to the very top; and if it had continued with that violence half an Hour longer, moſt of the Town had been in the utmoſt danger: Several Perſons were in great danger, but only one Woman drown'd; ſhe was hurry'd away with the violence of the Stream, and not found till the 4th day after: It removed the Bole of a large Oak (now ſold for about

about 4 Nobles) several Yards; bore down the most part of 4 Wood Bridges; and has left at the end of the great Stone Bridge, or within about 100 Yards of it, as much Gravel, &c. as is computed at above a thousand Cart Loads: One Neighbour gives Ten Pounds for removing the Stones and Gravel left in a small Tract of Ground.

This, Sir, to me seems very remarkable, because effected by the Rain alone; for the Minister adds expressly, “ For all this Deluge, the River *Nidd* kept within its “ Bounds: Thus the Divine Providence was pleased to “ temper Mercy with provoked Justice; I wish we may “ be as sensible of the Cause of this astonishing Calamity, as we are of the Effects.

Adver-

Advertisement.

WHereas in the many various Papers which compose these Philosophical Transactions, there have happened Expressions, which some have thought Reflecting; the Readers are desired to look upon all such Expressions as proceeding only from the Writers of the Papers, without receiving any Authority from the Royal Society, who leave the publishing of these Transactions to their Secretary, and without being observed by the Publisher before they came abroad. And for preventing the like Reflections for the future, all Persons that are desirous of having their Papers inserted into these Transactions, are requested to transmit them free from such Expressions, as may give offence, or cause their Papers to be laid aside.

L O N D O N:

Printed for *H. Clements*, at the *Half-Moon* in *St. Paul's Church-yard*. MDCCIX.

PHILOSOPHICAL TRANSACTIONS.

For the Months of March and April, 1709.

The CONTENTS.

- I. *Microscopical Observations on the Palates of Oxen, &c.* By Mr. Anthony van Leeuwenhoek, F. R. S.
- II. *An Experiment touching the Freezing of Common Water, and Water purg'd of Air.* By Mr. Fr. Hauksbee, F. R. S.
- III. *An Account of an Experiment touching the Freezing of Common Water, Ting'd with a Liquid said to be Extracted from Shell-Lac.* By Mr Fr. Hauksbee, F. R. S.
- IV. *An Experiment touching the Weighing of Bodies of the same Species, but of very unequal Surfaces, in Common Water, being of an equal Weight in Common Air.* By Mr. Fr. Hauksbee, F. R. S.
- V. *A Letter from the Reverend Mr. W. Derham, F. R. S. to Dr. Hans Sloane, R. S. Secr. giving an Account of some Inundations, Monstrous Births, Appearances in the Heavens, and other Observables he received from Ireland. With his Observations on the Eclipse of the Sun, Sept. 3. and of the Moon, Sept. 18. 1708.*
- VI. *A Letter from Mr. Ralph Thoresby, F. R. S. to Dr. Hans Sloane, R. S. Secr. concerning some Roman Antiquities observed in Yorkshire.*
- VII. *Part of a Letter from Wm. Burnet Esq; F. R. S. to Dr. Hans Sloane, R. S. Secr. concerning the Icy Mountains of Switzerland.*
- VIII. *A Brief Narrative of the Shot of Dr. Robert Fielding with a Musket-Bullet, and its strange manner of coming out of his Head, where it had lain near Thirty Years. Written by Himself.*
- IX. *An Account of Books; viz. I. Praelectiones Chymicae Oxoniae habite a Johanne Freind, M. D. Edis Christi Alumno.*
 II. *An Account of Animal Secretion, the quantity of Blood in the Human Body, and Muscular Motion.* By James Keill, M.D.

I. *Anatomical Observations on the Palates of Oxen,*
Sec. By Mr. Anthony van Leeuwenhoek,
F. R. S.

Delft in Holland, October 9th, 1708.

I Took a Cow's or Oxe's Head, and cut out of the Mouth of it the Roof or Palate, close to the Throat, while it was yet warm; and having prest it gently, I cou'd perceive that there issued out of several Parts of it, small, round, protuberant, and transparent Drops; and having prest it a little harder, there followed a yellow Moisture.

I took the uppermost Skin of the said Part, and viewed it thro' a Microscope, and observed, That upon most of the Places from which the aforesaid Moistness or Liqueur proceeded, there was a round Ring or Circle, that was of something a darker Colour than the Skin or Membrane that was next it; I cou'd likewise perceive in some of the said Places, out of which the Liqueur came, that there were small Holes or Orifices.

These moist places were not all of equal distance from each other.

From these Discoveries I began to consider, whether the closed Parts (which I had observed in the Membrane after it was slipp'd off) out of which the Moisture proceeded, were not Valves, thro' which the Moisture was brought into the Mouth, but none of it admitted to return the same way.

Moreover

Moreover I discover'd in the said Skin or Membrane, a very great number of exceeding small Protuberances, that stood cloier by one another than the Hair upon a Man's Head; I likewise observed in the uppermost thin Skin Holes, that were so very small that they almost escaped my sight, tho' I view'd them thro' a Microscope; for notwithstanding the Skin appears to our naked Eye very smooth and polished, yet I could discover that several parts of it were overspread with protuberant Particles, which far exceeded the aforementioned in largeness; I judg'd 'em to be thicker at the Root than a Hog's Bristle, and that they were in height about the Diameter of the same: When these last protuberant Particles were divested of the Skin that lay upon them, I cou'd perceive that each of them was armed with pointed Particles.

Thereupon I view'd the rough Skin or Bark that lay under the thin ones, and I perceived also in the same, such slender Fibres or Bristles that were of a darkish colour, and pass'd strait thro' the said Skin, agreeing with the small Protuberances and little Loies that I had discover'd in the uppermost Skin.

From this Observation I imagin'd, that the last mention'd holes or Orifices, and the little Fibres which I saw in the thick rough part, were those long Particles that receive the Juices, and which also produce that Sensation, which we call Taste.

After this I view'd those Parts that lie under the thick rough part, which appeared to me in some places to be nothing else than Yellow and White Glandules, about the bigness of a course Sand; and each of these Glandulous Matters were again compos'd of a great number of smaller Particles, Having each of 'em a different Figure, lying, as it were, involved in one another, and being about the bigness of the Particles of Fat, and which indeed one wou'd take to be such Particles; but when I

let

let them dry they were so shrunk in together, that one could hardly discover any parts of them, but when I moistned them again, they resumed their former Figure; whereby I was fully convinc'd, that they were no Particles of Fat: And between the said parts there is a great number of Vessels, but I did not take them to be Blood Vessels; and it also seemed to me that each Glandule was surrounded with a Membrane.

The uppermost Skin was cover'd with a very thin Membrane, which was not very closely united to the said Skin; and this Membrane is in my Opinion that which by the hot or sharp Moisture is easily separated from the Skin that lies under it.

The second Skin (in which the abovemention'd Valves were) I have often separated from that rough part that lies under it, and which one might also call a Skin, and which in some Places was about six times as thick as the uppermost Skin; and I have as often observed, that the Skin which I separated, did not only always remain fasten'd to the Valves, but likewise several times part of the Vessels, to which the Valves were united, remain'd fasten'd to it, which Vessels run into the Figure of a Tap or Funnel, that is to say, narrower inwards.

Now that we may have the better Idea of the Roof of that part of the Palate of an Oxe or Cow, where it is cut off next to the Throat, I caused a small Particle of the Skin or Membrane of the same, to be drawn by my Painter, as it appear'd to him thro' a Microscope.

Fig: 1. A B C D, represents a small Particle of the aforementioned Membrane, in which the round protuberant Particles are oppos'd to the Sight; and there also are described by E, F, the beforementioned Valves, which are seldom so close together as they are here shewn; and in the middle of which, in the dark part of them,

them, I several times discover'd an Orifice or Opening, which I suppos'd to come by Chance, and which is entirely shut or clos'd up when there were no Juices convey'd out of them.

I told you before, that the small Protuberances stood as close to one another as the Hair upon a Man's Head; at the same time I also discover'd several long slender pointed Particles, which I conceived to be rooted or planted in the Skin with a pointed end, and that these caus'd the aforementioned Protuberances; and notwithstanding that I did not perceive near so many of these long Particles, as I did of the Protuberances, yet I conclude, that the long Particles were at first as numerous as the other, but that a great many of them in the separating of the Skin might have remained sticking in it, as it has often happened to me in Operations of the same nature.

Afterwards I observ'd, that when I dissected the Skin, in which the aforesaid long pointed Particles were sheath'd, the said Particles were united to the Parts that lay under, and that they were there twice as thick as the upper end of them; and as near as I could measure them by my Eye, they were as long as four Diameters of the Hair of one's Head.

Now as these pointed Parts, which were fixed in the aforesaid Protuberances, were oppos'd to the sight with the Points uppermost, one cou'd not easily make any Observation of them; wherefore I cut off one of the slender Particles from the rest, that I might give you the better view of the pointed Parts.

Fig. 2. F, G, H, I, represents a small Particle of the aforesaid long Particle, so as it appear'd thro' a Microscope, of which F G shews the undermost part, which is as it were the Socket of the pointed Parts, and I H are the said pointed Parts.

When I had separated the Skin of the Roof of the Mouth of a second Oxes Head, and had cut the same thro' into very thin Parts, I observed abundance of little Holes, and a great many more Parts that were stop't, in which the long-pointed Parts remain'd sticking; whereupon I cut the same across, and observed, that the aforesaid pointed Parts stood so thick by one another, that there was not a Hairs breadth space between them.

Having observed that the Roof or Palate of the said Head, was closely united to the Bone that lay under it, I examined the external part of that Bone, and, with wonder discover'd so many Pores or Holes in it, that the Hairs of ones Head do not stand so near one another as the said Pores did; however I perceived that a great many of them were so closely shut, that one cou'd discover no opening in them, and the biggest of those Pores, which were but few in number, were as large as the Diameter of the Hairs of one's Head, and in one of them there also seem'd to be a Blood Vessel.

I must not omit that I was desirous to search into the inward Parts of the Nostrils of an Oxe or Cow, as well as I was able; in doing which I saw that each side of the Mouth (which one might call the Lips) was furnished with a great many pointed Parts, that were very thick in the inward Skin, and being round ran into a very slender Point; these Particles seemed to me at first very strange, being unable to Guess for what end they were framed.

I likewise made my Observations upon the Skin of several of the said Parts, which were very strongly united to the Parts that lay in it; and found that one of those Parts that lay within, did consist of a great many pointed Particles, which were much thicker and longer than those that I had discover'd in the inward Parts of the Tongue of an Oxe or Hog.

I caused a very small Particle of the forementioned Parts to be drawn, so as it appear'd to the naked Eye, as you may see in *Fig. 3.* K, L, M, N; only with this difference, that that which is drawn is not so thick and large as it shou'd be, because the Parts were dry'd and shrunk in, and they were moreover of the smallest size of any that I had dissected.

Fig. 4. O, P, Q, R, S, T, is a very small piece of the foremention'd Particle, which was strip'd of its second Skin, and in which some few of the pointed Parts were standing out, but most part of them lie close upon the said Particle.

I observed, that that pointed part, represented by S, stood out longer than the rest, and that it was composed of several long Particles united together, the longest of which was standing out above the rest, and ran into such sharp Points, that they appeared thro' the Microscope just as the Point of the smallest Sewing-Needle does to the Eye; and the reason why we can't see these sharp-pointed Particles always in each part, is in my Opinion, because they are so united to the two Skins, with which they are as it were cover'd, that they can't be separated from them without leaving some part sticking in one or other of them; I have also observed some, of which the extream Parts consisted of four distinct Points of equal length.

In some of those sharp Particles that are standing out in *Fig. 4.* such for instance as are described by Q and R, we cou'd see very plainly, that each of 'em consisted of three long Particles, the middle of which was the longest; from whence I considered, whether each of those long Particles were composed of other long Particles, which, upon the Account of their exceeding smallness, might escape our sight.

I have said in my former Letter, that the thirnest part of the Tongue of a Doe is composed of Bony Particles, and that in those parts she enjoys the Taste.

Now to shew, that at the Chewing of his Victuals, does not only break the Meat, and shutting of the Mouth, but by the Motion of the lower Jaw from side to side, as it were scower it over the harden'd Teeth, by which the Meat is yet more broken and grained than it could be by the direct opening and shutting of the Mouth as aforesaid.

Now if we suppose, that by the aforementioned Motion, the Victuals are convey'd among the manifold Parts, a small Particle of which has been before described in *Fig. 3.* K, L, M, N; and that those Parts by the Motion of the Mouth, do cause such a pressing or kneading of the Particles of the Meat, lying amongst them, that the said Meat is, as it were, insinuated into the Parts, and by this means a stronger sensation of Taste is produced in the Chewing of it again, than the Tongue enjoy'd at first; and thus that which is wanting to the Tongue to enjoy the Taste, is doubly made good to it by those Parts that are in the side of the Mouth.

As little as the space is between the aforementioned pointed Articles, I thought with my self that there might be other and yet smaller pointed Particles lying in the Skin between the greater, and fastned in the lower Parts; and thereupon I discover'd that there were a very great number of pointed Particles shut up in the Skin, and which lay so close by one another as the Hair of one's Head; the Points of these seem'd to me to be mostly blunted: Afterwards I observed, that a great many of them were thick, close at the Root, and that the upper part of them was three times as slender as the undermost; from which Discovery I concluded, that they were all of them of such a Figure, and that in separating them from the Skin, most of the slender Parts were broken

broken off and left sticking therein; and when I follow'd them into the under Parts, I found that they were three times as long as they had lain in the Skin that was taken out; and they were still so far as it appeared to me) the arteries ended in a great number of very small Vessels, about four times as thick as where they were fixed in the Skin.

I have once thought with my self, that as according to my Opinion the said Particles were endued with a little of the Juices of the Meat, which we name Taste, whether each of these Particles might not imbibe a small Quantity of those Juices, and carry them on so far, till they arrived at the exceeding small and slender Blood-Vessels, which we call Veins; and that these Juices are, as it were, filtrated or strain'd thro' the Tunica's of the Veins, and so conveyed to the Heart; and thus from the Mouth does the Body enjoy a little Nourishment: but I submit this Thought of mine to the Judgment of the Honourable Society.

Now if each of those Particles in the Mouth shou'd derive down to the Body no more than the thousandth part of a very small drop of Moisture, or Juice of that Food which the Oxe Eats or Chews, in the space of an Hour, what a vast quantity of Nourishment must the Body receive from the Mouth in any continued time?

II. *An Experiment touching the Freezing of Common Water, and Water Purg'd of Air.* By Mr. Fr. Hawksbee, F. R. S.

THIS Experiment was recommended to me, in order to discover what difference would happen in the Swelling or Bulk of Ice, producible on the Freezing of Common Water, and Water Purg'd of Air. Accordingly I procur'd a couple of Glasses, in form of the Figure in the Margin. These, when fill'd with the different Waters to a determinate height, supposing at *a, a*, I convey'd into the Freezing Mixture, (which was nothing else but a Composition of Snow and Bay-Salt powder'd pretty fine) where they did not remain above three or four Minutes of time, before the Congelation began in each of them, which was very discernible, by the Ascent of the Water in their respective Tubes, above their first Heights *a, a*; and in about an Hours time, it had ascended in that Glass, which contain'd the Water purg'd of Air, at least 6 Inches; but in the other Glass with common Water, not so much by more than an Inch; there being such a Disparity in the Content of the two Glasses, the last mention'd being less by a fifth part than the other, which contain'd not full four Ounces. It was observable, that during the Glasses continuance in the Frigorifick Mixture; small Bubbles of Air did continually ascend in that which was fill'd with Common Water, but



but not the least sign of any such appearance in the other. When I had taken them out of the prementioned Mixture, (which was at something more than an Hours time from their first putting in) I pour'd from them the Unfrozen Water, which gave me the Liberty of discovering the various forms the new matter had shot it self into. That Glass which contain'd the Purged Water, appearing all over the Sides and upper part of it, to the very Neck *bb*, of divers Figures, much resembling those of Salts. The Bottom part of it *cc*, discover'd it self to be seemingly solid, but whitish, as if it was full of very minute interspers'd Vacuities; but not like those Cavities, which are very observable in the Freezing of Common Water; and what was very notable, at the Bottom of the other Glass they appear'd in great Numbers, of a longish Form, seemingly pointing all round from the Circumference to the Centre of it. There were none of those prementioned Salt-like Figures on the sides of this, as the other, but it was almost clear from any Adherence of Ice, saving towards the upper part near the Neck, where a little had fasten'd it self with those longish Bubbles, pointing from that part downwards, inclining to the Centre. From all which I cannot but conclude, that the Ice produc'd from the Water purg'd of Air, was equally augmented in its Bulk to the Quantity of Water from which it was produc'd, as that which proceeded from the Frozen Common Water; for had the Glasses been of an equal Content, I see no reason to doubt, but the Water would have been equally Frozen in both, and the Ascent of the unfrozen part of them would have been much the same in their Tubes. But if there be any difference, the Water purg'd of Air seems to claim the easiest Disposition to be Frozen.

The Water I purg'd from Air in the following manner.

I first put it well over the Fire, afterwards I put it in a *Vacuo*, where it remain'd in that state till it was cold; from whence I took it, and put it presently on the Experiment, which I found always succeeded alike.

III. *An Account of an Experiment touching the Freezing of Common Water, Ting'd with a Liquid said to be Extracted from Shell-Lac. By Mr. Francis Hawksree. F. R. S.*

THIS Liquid is a very deep Red; a small quantity of which, will Tinge twenty times as much of Common Water of a very good Sanguine Colour hardly Transiparent. I found this Liquor, Extracted from *Lac*, would not Freeze, for during the Coldest Weather we have lately had, it remain'd in its Fluidity; and when it was mixt with Water, and expos'd to Freeze, the Water, in which it was mixt, soon suffer'd a Congelation; and so much of it as underwent the Change, appear'd of a fine but pale Transparent Red; the Body of the Colour retiring into the Middle, in form of the Figure *a a*, in the Margin, and was wholly Opake. And when no more of the mixt Liquid would be Frozen, I took the Body of Ice out of the Glas that contain'd it,



it, by just warming the sides of it by a Fire. I found then by pricking a piece of Wire into the dark part of it, the Red Liquor immediately succeeded thro' the Hole I had made, seemingly as pure and as abstracted from any Mixture of Water, as it was before it was put into it. This Red Liquor I found to be something specifically heavier than Common Water; which makes me wonder, why the Figure it made on its retiring, was not rather the reverse to what it appear'd: For I should think it reasonable to expect, that the upper part, which was the broadest, should, by its own weight, alter or reverse the Position of the Figure. Another thing very remarkable, was, that this retir'd Liquid, as it seem'd to keep an equal distance from the sides of the Glass, so did it from the bottom and top of it; which upon repeated Tryals answer'd the same.

I likewise mixt some Common Water with a strong Purple Liquor, made from Logwood, boyl'd in Water, in which some Allom had been dissolv'd. A little of this would give a strong Tincture to a pretty Quantity of fair Water; and when expos'd to Freeze, would retire towards the Middle, leaving the first Frozen Water of a very pale Purple, in comparison to the middle part; which when I had taken out of the Glass that contain'd it, and broke it, I found 'twas Frozen through, but of so dark a Colour in the middle, that it came near a Black.

IV. *An Experiment touching the Weighing of Bodies of the same Species, but of very unequal Surfaces, in Common Water, being of an equal Weight in Common Air.* By Mr. Fr. Hauksbee, F. R. S.

I Took a Piece of Sheet-Brass (which I take to be more close and solid than that which is cast) of an exact Square Inch, weighing just 482 Grains. I then cut as many Square Inches of Brass Tinsel, as were equal to the same weight : The Number of these Square Inches were 255. Now these being of an equal weight with the other single piece in Common Air, I concluded from the inequality of their Surfaces, that a considerable disproportion in their Specifick Gravities would ensue, by weighing them in Water ; the Water in one touching so many Parts of the Superficies more than in the other : And 'twas from what is generally asserted, That the smaller Bodies are, so the Disproportions of their Bulks to their Superficies encrease ; and that supposing them infinitely small, or as Gold dissolv'd in *Aqua Regis*, or Silver in *Aqua Fortis* must be, then their Superficies being touch'd by so many Parts by the including *Mensstruum*, which is in such a Disproportion to their Diameters or Bulks of Matter, as disposes them to remain suspended in it. This I take to be the General Solution of that Phenomenon ; and 'twas these Considerations that gave Birth to this Experiment. Yet when I came to bring it to the Test, I found, to my great surprize, (being prepossess'd on the contrary) but two Grains difference, the single Piece weigh'd in the Water about

422 Grains ; all the other Bodies together, hardly two Grains less : And this upon two or three Tryals succeeded much the same, notwithstanding they were made with all the Caution imaginable. Now since so small an Inequality is the Matter of fact, between Bodies of the same Species weigh'd in Water, whose Disproportions of Surfaces are, as 1 to 255, (for I reckon the Sides of all the Tinsel Bodies to be equal to the Sides of the single Brass piece,) I must conclude, That those Bodies must be infinitely small, whose inequality of their Surfaces to their Bulks does exceed those in this Experiment : For supposing one of these thin Squares should be wrought into the form of a Globe, I am very apt to think, That the Disproportion then of its Surface to its Bulk of Matter, would not be so great as its Present form renders it.

Moreover, That altho the Disproportions of the Surfaces of Bodies, to their bulk of Matter be very great ; yet, that that is the only Reason why a Metalick Body should be suspended in a *Menstruum* specifically lighter than it self, is very doubtful : For certainly if it was so, we might reasonably have expected to have met with a much greater Difference in the Bodies made use of in the newly recited Experiment : For there it should seem necessary, that where we had so great a Difference in point of Superficies, there we should also have had a Difference something proportional in point of weight ; which did not happen. I think therefore that there must be some other Agent, or Quality, not only to assist, but Govern in the Case. And what we call a corroding *Menstruum*, I take to be a Fluid adapt to attract such, or such a Body, (as we find no one of them to operate alike on all ;) but, as I said before, *Aqua Regis* for separating the Parts of Gold, *Aqua Fortis* for Silver : Now this Separation of their Parts by Attraction, seems to proceed from the *Menstruum's* Affection to the Body Im-

merit^d, and the Body reciprocally to the *Menstruum*, and both to act on one another with greater Vigour, than either of their own Particles do upon their contiguous Fellows; by which means a Separation of Parts must (I think) consequently follow. Thus being at liberty, they with the *Menstruum* become as one Body, and remain suspended in any part of it by their Mutual Attraction. And that one *Menstruum* in this Case should affect one Body more than another, is no more than why the Magnet should affect Iron only.

V. *A Letter from the Reverend Mr. W. Derham, F. R. S. to Dr. Hans Sloane, R. S. Secr. giving an Account of some Inundations, Monstrous Births, Appearances in the Heavens, and other Observables he received from Ireland. With his Observations on the Eclipse of the Sun, Sept. 3. and of the Moon, Sept. 18, 1708.*

Upminster, October 26. 1708.

S I R,

I Received some time since a Letter from *Maghraselt* in the North of *Ireland*; from a very Intelligent Person there, and great Well-wisher to our *Royal Society*, one Mr. *Nève*; who out of his own good Will had collected some of the *Lough-Neagh* Petrifications, Pieces of the *Giants-Causway*, and other Curiosities, and sent them, he tells me, as far as *Bristol*: But hearing the Society had of them already in their Repository, he took no further care of them.

He

He hath sent me divers Particulars relating to *Lough-Neagh*, which I give you no Account of at present; because there is nothing but what is in effect in Mr. *W. Moyleaux's*, and Mr. *Edward Smith's* Accounts, already published in the *Transactions*. But there are some other Matters related by him, that I believe will not be unacceptable.

He tells me, That on *October 7. 1706.* after a very Rainy Day, and Southerly Wind, there happened a prodigious Flood (the like not in the Memory of Man) which brake down several Bridges, and the Sides of some of the Mountains in that part of *Ireland*. That it came running down in vast Torrents from some of the Mountains, and drowned abundance of Black-Cattle and Sheep, spoiled a great deal of Corn and Hay in the Stack, that it laid abundance of Houses two or three Feet deep in Water, and brake down several of the Forge and Mill-Dams.

Also on *July 3, 1707.* they had another Flood, which came so suddenly from the Mountains, as if there had been some sudden Eruption of the Waters. And also on the 26th of the same Month, in the County of *Antrim*, there was a very suddain and surprizing Flood, which raised the *Six-Mile-River* (so call'd) at that rate, that it brake down two strong Stone-Bridges, and three Houses, and carried away 600 Pieces of Linnen-cloath, that lay a Bleaching, fill'd many Houses several feet deep with Water, tore down some large Rocks in its Passage, and left several Meadows covered a Foot or two deep with Sand. That they in the South-East part of the County of *Derry* had that Day but little Rain with some Thunder: But beyond the Mountains, in the North-West part of the County, the River *Roe* had a great Flood.

Another thing he gives me an Account of, is of some *Monstrous Births*, viz. That an Alderman of the City of *Derry* told him, That a *Cow* in the Year 1706 had, within a Mile of that City, calved six Calves, then all dead. That the Barrack-Master told him, *December 6. 1716*, of a *Monstrous Humane Birth*, which the Barrack-Master said he himself saw in *London-Derry*, viz. with two Heads, four Arms, and but one Body at the Navel. That it was of both Sexes, Female on the Right side, Male on the Left. That the Right Hand of the Male was behind the Female's Back, and the Left Hand of the Female behind the Male's back, holding each other, as in Loving-manner. This Child, or Children were born Alive, but liv'd but a little while. My Friend was informed, that this Monstrous Birth was dissected by the Mayor of *Derry* (his Acquaintance) and (if it would be any Service or Satisfaction to the Society) he told me he could easily procure a full Account of his Observations.

The last Curiosity he gives me an Account of, is, as I imagine, that which some call the *Northern Streaming*, which I do not remember the Society had ever any Accounts of; and this being (I must confess) one of the most particular Accounts I ever met with of it, and very consentaneous to such another Appearance in the Heavens, which my Ingenious Neighbour and Friend Mr. *Barret* (of the Society) was credibly informed was seen in his Neighbourhood in *September* or *October, 1706*; I say Mr *Neve's* Account being so particular, will I hope be very acceptable to the Society: It is thus.

“ On *Sunday, November 16, 1707.* after a Frosty Morning, and Fair still Day, Wind North-Westerly, about
 “ half an Hour after Eight in the Evening, there appeared a very strange *Light* in the North. The Evening was clear and Star-light, only the Horizon was
 “ darkned with condensed Vapours in the North, reach-
 “ ing

“ ing, I guess, 10 or 15 Degrees above the Horizon.
 “ Out of this Cloud proceeded several *Streams* or *Rays*
 “ of *Light*, like the Tails of some Comets, broad be-
 “ low, and ending in Points above. Some of them ex-
 “ tended almost to the Tail of *Ursa Minor*, and all were
 “ nearly perpendicular to the Horizon, and it was as
 “ bright as if the Full Moon had been rising in the
 “ Cloud. But what I wondered at most, was the Mo-
 “ tion of the dark and lighter Parts running strangely
 “ through one another in a Moment; sometimes to the
 “ East, and sometimes to the West. It continued, after
 “ I first saw it, about a Quarter of an Hour, often
 “ changing its Face and Appearance, as to Form and
 “ Light; sometimes broken, sometimes entire and long
 “ Rays of Light in the clear Sky, quite separate from,
 “ and above the Cloud, and none below in the Cloud.

To prevent Mistakes, I think it necessary to observe,
 that this Light which Mr. *Neve* saw, is very different
 from that like the Tail of a Comet, which hath been
 seen in the Constellation of *Taurus*, or near it; which
 I happened to see in 1766, the Figure whereof is pub-
 lished in the *Transact. N.* 305, and which some are plea-
 sed to call the *Aurora Borealis*; which Name, in my O-
 pinion, would better besit this *Lumen Boreale*, which is
 seldom, if ever seen out of the North.

*The Eclipse of the Sun on September 3. in the Morning,
at Upminster.*

The correct Apparent Time.			
h.	'	"	
6	44	15	The beginning of the Eclipse we could not see for Clouds.
			The Sun peep'd out of the Clouds, and I judged, by my Eye, that about one Tenth of a Digit was Eclipsed.
			Then Clouds nearly all the time of the Eclipse. But at
8	31	15	A little Obscuration appeared through the Telescope.
8	32	45	A <i>very</i> little Obscuration, through the Telescope.
			Then Clouds. And at
8	35	45	We could discern no remains of the Eclipse through the Telescope.

From these Observations I imagine the End of this Solar Eclipse was much about 8 h. 33' in the Morning.

The Eclipse of the Moon, September 18. in the Evening, at Upminster.

As I was that Evening coming from *London*, I observed for half an Hour, or more, a thin shade to possess that part of the Disk where the Eclipse began, which remain'd a good while after the Eclipse was over. After I got home, I made a shift to mount my Telescopes, and get all things in readiness before the Eclipse began. And the principal Observations I made thereof, were these following.

The

The correct Apparent Time.			
h.	'	"	
7	56	30	A Thin Penumbra.
7	57	40	A darker Penumbra.
7	59	00	Yet darker, which may pass for the beginning of the Eclipse.
8	00	00	The Eclipse no doubt begun:
9	01	00	The Lucid Parts of the Moon, not long before the Middle of the Eclipse, were 925 Parts of my Micrometer.
9	16	40	Diameter of the Moon 1634 Parts of the Micrometer.
10	23	11	The End of the Eclipse draws nigh.
10	25	00	A little Obscuration.
10	26	00	Less.
10	28	15	A very little, excepting the Duskiſhneſs before mentioned.

VL. A Letter from Mr. Ralph Thoresby, F. R. S.
to Dr. Hans Sloane, R. S. Secr. concerning some
Roman Antiquities observed in Yorkshire.

Leeds, April 23, 1709.

Honoured SIR,

THERE have some Roman Monuments been lately found amongst the Ruins upon *Adel* or *Echop-Moor*, but having no legible Inscriptions, they are not worth troubling you with the Draughts of them, only their Size seem'd strange to me at first; that there should be Altars so small, was indeed no surprize, I having one (inserted in the *New Britannia*, p. 782.) little different; but that any other sort of Commemorative Monuments should be so little as eighteen Inches high, and only six broad, was new to me, till I found others as small, tho of richer Materials, being Marble, in the Noble Collections of *Christopher Wren* Esq; and *Mr. Kempe*; whereas these are of a very coarse Stone, as *Dr. Lister* has truly observed, most of those found in the North are. One of these, as appears by the *Discus*, has been evidently one of their portable Altars; but another instead of the Hearth, having three intire Rolls or Wreaths, 'tis certain was never design'd for that purpose.

When the *Vestigia* of this Roman Station were first discovered, (of which see *Numb. 282* of the *Philosoph. Transactions*) I was ready to fancy it to have been the *Adelotum* of the Ancients, from some remains of the Name in the present *Adle* or *Adel*, as it is writ both in the *Monastic. Anglic.* and some ancient Charts in my possession; but when I was last at London, having by the fa-

vour

vour of *Peter Le Neve* Esq; *Norroy* King at Arms, an opportunity of perusing that Venerable Record *Domesday-Book* in the Exchequer, I found besides *Adel* and *Echope* beforementioned, another Place in the Neighbourhood, call'd *Burghedurum*. or *Burghdunum*, which I am now ready to conclude, was the Ancient *Roman* Name of this Station: That the Itinerary is silent herein, is no Argument against it; for none, I presume, do imagine that the Names of all the Towns in the Province are there recited; but only such as lie upon those Roads that are particularly mention'd; but that it has, at least, the Appearance of a *Roman* Name may be argued, because *Burgi* was the common Name whereby they called such Castles or Forts as were convenient for War, and well stored with Provisions of Corn, as appears by the Authorities quoted by *Camden* and *Burton* in their Notes upon the *Roman* *Vertera*, or *Burgh* under *Stanemoor*; and the *Burgundians* rec'd their Name from their inhabiting such Castles: and to me it seems probable, that the small squared Stones, wherewith the very Antique Church at *Adel* is built, were brought from the Ruins of such a Castle, and gave rise thereby to an old Tradition, which continues to this day, that *Adel-Church* once stood upon *Black-hill*, the place where these *Roman* Monuments were found; the elevated situation of which place sufficiently accounts for the termination of the Name, the *Gaulish* or *British* *Dunum*, which signifies a Hilly or Mountainous Place, being naturalized in the *Roman* Provincial Language. I shall only add, that within a Mile of it, there are two scattering Houses, that do to this Day retain the Name of *Burden*- (for *Burghdan*-) *Heag*

VII. *Part of a Letter from William Burnet Esq;
F. R. S. to Dr. Hans Sloane, R. S. Secr. con-
cerning the Icy Mountains of Switzerland.*

Geneva, October 12, 1708.

S I R,

AFTER I had been at *Zurich*, I resolv'd to go my self and see the Mountains of Ice in *Switzerland*. Accordingly I went to the *Grindlemald*, a Mountain two Days Journey from *Bern*. There I saw, between two Mountains, like a River of Ice, which divides it self in two Branches, and in its way from the top of the Mountains to the bottom swells in vast Heaps, some bigger than *St. Paul's Church*. The Original of which seems to have been this. These Mountains are covered all the Year with Snow on their Tops; this Snow has been melted in the Summer, and has fallen to the Bottom where the Sun never reaches: There it has Frozen, which every Body knows happens more easily to melted Snow than ordinary Water. Thus every Year it has increased, till it has touch'd the very Top. The reason why the Water has always frozen, tho' the Sun in the middle of the Mountain, and higher, shines upon it some part of the Day, is that the melted Water goes under the Ice already form'd and there freezes, and so expanding it self raises the Ice above it, and sometimes makes Cracks in it, that frighten the whole Neighbourhood: The reason appears plainly, because the upper Surface being solid, cannot be dilated without making great Chinks, and that with a terrible noise. They told me, upon the Place, that every seven Years the Mountain

tain increases, and the next seven decreases ; but I doubt their Observation is not exact, and I suspect that they say it, to seem to know something singular. Besides there are none there that have themselves observed it long enough, to affirm any thing of that kind certainly. If there is any ground in that Observation, it seems to be, that in the hottest Summers it increases, and the more moderate ones it decreases, there being then less melted Snow ; in which case it is at present, as we know of late, the Summers have been moderate. [See *Philosoph. Transact.* Numb. 49 and 100.]

VIII. *A Brief Narrative of the Shot of Dr. Robert Fielding with a Musket-Bullet, and its strange manner of coming out of his Head, where it had lain near Thirty Years. Written by Himself.*

AT the first *Newberry* Fight, in the Time of the late Civil Wars, the Doctor was shot by the Right Eye on the *Os Petrosam*, by the Orbit of the Eye to the Skull, which was likewise broke, with great Effusion of Blood from the Wound, Mouth and Nostrils.

The Surgeon carefully probing the Wound for the discovery of the Bullet, but failing of his intention, on the third day after the Shot, plac'd him Horizontal to the Sun ; by which means depressing the broken Skull with the Probe, he could see the Palpitation of the Brain, but could not discover the Bullet.

When the Doctor began to grow cold, his Mouth closed up, and so continued for the space of half a Year, till many Fractures of Bones were come out of the Wound, Mouth and Nostrils ; and afterwards when-
 forer a Scale of Bone was to come out, his Mouth
 would

would close, infomuch that several Years after he Prognosticated to some Friends, that a Bone was then coming out, which continued so for 6 or 7 Weeks; at which time finding an itching in the Orifice of the Wound, with his Finger he felt a Bone, upon which he made known to some Friends then present, that they should fetch him open his Mouth, and taking out a Bone no bigger than a Pins Head, he immediately opened his Mouth.

At the second *Newberry* Fight it heal'd up, no Art could keep it open. After this, for the space of Ten Years, or more, a Flux of Sanious Matter issued out of the right Nostril, and then ceasing there, it flow'd from the left Nostril for some Years: At length, for the space of two Years or thereabouts, upon riding, the Doctor would sometimes find a pain on the left side about the Almonds of the Ear, which he attributed to Cold, but more especially after riding in a cold dark Night, which occasion'd a kind of Deafness too; and having stop'd his Ear with Wool to recover his Hearing, one Day, either Writing or Reading, suddenly an Huffle came in the Ear, which made him start, and the manner not to be express'd, unless you can imagine a *Vacuum*; this happen'd about *March* or *April* 70. Upon this all that side of the Cheek hung loose as tho' Paralytick, and under the Ear might be felt a hard Knobb.

After this, Tumour upon Tumour appear'd on that side under the Jaw-Bone, which occasion'd his consulting some Physicians, two at one time; one of which suspected the Bullet, which, considering the Shot, they thought not credible. At length the Tumours coming to the Throat; if he held up his Head a little, it seem'd as if one with a Hook did pull down the Jaw-bone, and if any thing touch'd the Throat, 'twas as painful as if prick'd with a handful of Needles; being at last persuaded to make some Applications, a small hole appear'd.

ed, after that another, and a third near the *Ponum Adami*; by these the Bullet was discover'd, and cut out in *August* 1672.

IX. *An Account of Books; viz. I. Praelectiones Chymicae Oxoniae habitae a Johanne Freind, M.D. Aedis Christi Alumno.*

TH^{O'} the Art of Chymistry is at present much improved, and abounds with many excellent and useful Experiments; yet it must be acknowledg'd, that hitherto there has been made but a very little Progress in the Philosophy of it; and that Men are still to seek for the Reasons of the many strange Phenomena it produces. The Chymists generally making use of such Principles as have no foundation in Nature, it is no wonder if their Philosophy is inconsistent with itself, and is neither to be explain'd or understood. On this Account the Learned Author of this Excellent Treatise, without considering the Principles and Errors of former Chymists, endeavours here to give a clear and easie Account of the chief Operations of Chymistry from the true Principles of Natural Philosophy, and chiefly that of *Attraction*; which, he says, is no Figment or Hypothesis, but deduced from many plain Experiments, and grounded on the Laws of Nature and that Habitude that is found among Bodies, but particularly from the Observations that are to be made in Chymistry it self. This Principle of Attraction, with several other Lemma's that are borrowed from Geometry and Mechanicks, he explains and lays down as Axioms, which are to be understood, before any Progress can be made in the Science of Nature.

Nature. And because Chymistry is an Art of joyning Bodies that are separated, or separating such as are joyned, he divides the Operations of Chymistry into two sorts; *viz.* such as disunite the Parts of bodies from one another, and such as compound or mix them together. The Chymists not agreeing what are to be put in the second Class and what in the first, he follows a new Order, and among the first Clais he reckons *Calcination, Sublimation* and *Distillation*; in the second are ranked *Fermentation, Digestion, Extraction, Precipitation* and *Crystallization*.

His design in this Treatise is to explain first, The Method of each Operation according to this Order, and the Mechanical force by which it is produced. Secondly, The different ways by which it commonly is, or may be performed : And Thirdly, He gives us many particular Experiments, which he explains and reduces to the General Theory laid down at first. Accordingly we have here the reason of the Cohesion of Bodies, which he draws from the Principle of Attraction, and the quantity of Contact; the Causes of Fluidity and Liquation; the reason why some Bodies, as Wax and Metals, being melted in the Fire, and afterwards cooled, do return to their first Form, whereas others by Fire acquire a new one: How it comes about, that the absolute weight of Bodies is generally after Calcination encreas'd, and the Specifick Gravity diminish'd. We have also the reason, why Fluids rise in an Alembick; and he shows that if a Globule of Water be so rarified, as to have its Diameter made only ten times greater; it will become lighter than the Air, and consequently must rise up in it: But if the Diameter be encreased in the proportion of 12 to 1, the Bubble of Water becomes more than twice as light as our common Air, and must therefore rise so much the faster. Besides this, the Air itself being rarified must necessarily rise up, and the force of its motion carry

ry with it what Bodies it meets with in its way; which will more easily ascend according as their Surfaces are greater in proportion to their weight. And our Author tells us, that if the Specifick weight of Bodies, the force that impels them, and the measure of their Surfaces be rightly consider'd, it will be no hard matter to give an account of Volatility and Fixedness, and all the appearances of Distillation and Sublimation; in which last only solid Bodies are rais'd by the force of Fire.

In his Lecture on Fermentation, he deduces the cause of Ebullition and Effervescence from the attractive force of the Particles of Matter, and particularly those of Salts; which he says are very simple and small Bodies, and in proportion to their bulk very solid, and must of consequence be endowed with a very strong attractive Power. Upon which account, and that of the smallness of their force of Cohesion, he shows the reason why they are so easily dissolved into Water, and not in Spirit of Wine; as also why Water can only dissolve a certain proportion of these Salts, so that whatever quantity greater than this is immersed in Water, remains undissolved.

The Solution of all other Bodies is to be deduced from the same Principles; but to understand them rightly, it is necessary to estimate the wideness of the Pores of these Bodies, the force by which the Parts cohere together; and the efficacy or force of motion in the Parts of the Menstruum; which last arises from the difference of attractions of the Particles of the Menstruum to one another, and to the Parts of the Body, and from their elasticity. And upon these Grounds he explains the various Phænomena of Dissolutions; particularly of that hitherto unaccountable one of *Aqua Regia* dissolving Gold, but not *Silver*, whereas *Aqua Fortis*, of which the *Aqua Regia* is made, dissolves *Silver* but not *Gold*; which he illustrates and reduces to a plain Calculation.

In the Lectures on Digestion and Extraction, he shows that there is a Tenacity in all Fluids, by which their Parts do in some measure cohere together, and hinders their Effects from being the same as in a perfect Fluid. He gives us the method of estimating this Tenacity, and of finding out the proportion it may have to the weight of other Bodies; and from thence he explains how small Particles of Matter, that are either specifically lighter or heavier than the Fluid, may be sustained in it, which he explains by a Calculation; and shows, that if the Gravity of the Body be to the Tenacity of the Fluid as P to 1 , if the Body be divided into Parts, whose Diameters are to the Diameter of the whole as 1 to P , then these Bodies may be sustained in the Fluid, tho' specifically lighter than themselves.

He observes, that Tinctures made by Digestion are usually very strong, and saturated with the Body whose Tincture is extracted; but if the Tincture be distilled in an Alembick, the Menstruum generally rises with its former colour and clearness, leaving the Body behind it: The reason of which he explains.

He considers the several Preparations of Opium, and condemns such as are made by the fumes of Sulphur, or by acid Liquors; in which either the vertue of the Opium is lost, by the evaporation of its Volatile Particles, or destroyed by acid Salts, whose qualities are directly opposite to that of Opium; the one coagulating or making the Blood viscid, whereas the other attenuates it, and renders it fluid: But he approves of such Preparations of Opium as are made with hot and aromatick Medicines, which heighten its Vertue; and seems to prefer Dr. Sydenham's Preparation with Canary Wine to all others.

Precipitation, he says, may be made by infusing a Liquor, that is specifically lighter or heavier than the Menstruum: For by the first the *Æquilibrium* that was
between

between the Gravity of the Particles swimming in the Menstruum, and the Tenacity of the Fluids, is destroyed, on which account they must sink. By the second, the Particles will be carried down to the bottom by the force of a heavier Fluid. He shows likewise, how Precipitation may be caused by infusion of Saline Menstruums, whose Salts attracting the Particles that swim in the Fluid, and cohering with them, they will form such Bodies, whose Gravity will over-power the Tenacity of the Fluid, and descend. From which Principle he deduces the reason of all Chymical Coagulations.

In Crystallization of Salts, he observes, that a great part of the Fluid, in which they are dissolved, is evaporated: On which account, their Particles coming nearer to one another, their attractive force is encreased, and they will come and unite together; and because the Figures of the minute Particles of each Salt are always uniformly the same, and their attractions being stronger on one side than another, they will always cohere to one another in such sides as have the greatest attractive force. On which account they must necessarily form Bodies of certain determin'd Figures, which in the same sort of Particles are always the same.

II. *An Account of Animal Secretion, the quantity of
of Food in the Human Body, and Muscular motion.*
By James Keill, M. D.

THE Author of these Discourses prefixes a Preface, wherein he shows the necessity of a right Knowledge of the Principles of true Philosophy, and of the Animal Oeconomy in the Practice of Physick; where our Skill in curing Diseases, whose Histories are known, is always proportional to our Knowledge of the Animal Oeconomy, which of it self is a considerable part of Natural Philosophy. He does indeed blame the too common Method of Philosophizing on Principles not drawn from Nature, but such as are the uncertain fictions of the Brain, whose real existence can never be deduced from Experiments. This sort of Philosophy, he says, is very prejudicial to Physick: Men being generally fond of their own Productions, have not stuck to mould new Diseases to answer their Hypothesis; so that most of the late Histories of Diseases are only Philosophical Romances; but notwithstanding this, Natural Philosophy, and the History of Diseases must go Hand in Hand in improving the Art of Curing: And he affirms, that there is no Man that practices, but who does it on some Knowledge of the Animal Oeconomy, or some Notions of his own, which are more or less clear, according to his Skill in Natural Philosophy. He proves likewise from *Hippocrates* and *Galen*, that the Principle of Attraction of the small Particles of Matter to one another, was known to the Ancients; the Philosophy of *Hippocrates* being built on a certain propension which some things have to one another, whereby they attract, retain, and alter each other.

In

In the first Discourse, he proves by Observation, that both the red and ierous parts of the Blood are endowed with an attractive Power; and as in the Blood the Particles attract one another, and cohere together, so likewise do the Particles of different Fluids, that are separated from it by Secretion. He says, it is evident that some of the Fluids, that are secret'd from the Blood by the Glands, are really compos'd by the cohesion of several sorts of Particles; for in Milk there are 3 or 4 several sorts of Substances. Urine has the same appearances, and contains perhaps more Principles, and there is no doubt but that Tears, Spittle, and Sweat are all compounded, Liquors. Now if the Particles which attract one another, are still more powerfully attracted by the Fluid in which they swim than by one another, they can never of themselves separate from the Fluid; which is the case of Salts dissolved in a large proportion of Water, and of Urine when it neither breaks nor settles: But if the Particles swimming in the Fluid are more strongly attracted by one another than by the Fluid, they must necessarily separate from it, and go into parts which will either sink, swim, or ascend in the Fluid, according to their specifick Gravity. This power of Attraction, he says, is universally diffused throughout all Matter, and the real existence of it, he says, can be denyed by none that will duly consider the Experiments and Reasons given by Sir *I. N.* in the Questions annexed to the Latin Edition of his *Opticks*; and it seems to be the only Principle from which there can be drawn a satisfactory Solution of the Phenomena produced by the *Mineral Nature*. And because the whole Animal Oeconomy depends upon it, he lays down in eleven Propositions so many of the Laws of that universal Attraction, with their Demonstrations, as are requisite for his present purpose; and then proceeds to show how the Corpuscles that compose the

Se...

Secretions are formed in the Blood before they arrive at their secreting Glands: But because the Particles of the Blood returning by the Veins and attracting one another, are formed into Globules too big for any Secretion, he shows how these Globules are broken and divided in the Lungs by the force of Respiration: And from Experiments, and the Doctrine of Staticks, he calculates the pressure of the Air upon the Lungs to be equal to the weight of 100 Pound; and because the difference between the greatest and least Gravity of the Air is $\frac{1}{10}$ of the greatest, he from thence shows how Asthmatick People are very sensible of this difference, especially when they breathe thicker; for if they perform their Expiration in half the usual time, it will make this difference equal to 40 Pound weight, which is almost equal to half the Pressure of the Air in ordinary Breathing.

He shows, in the next place, how from the great Velocity of the Blood, the friction on the Coats of the Vessels, the Impetus of the Particles on one another, and their Elasticity, there must needs arise near the Heart a strong intestine Motion in the Blood, on which depends its heat; and by consequence near the Heart, where the Motion is greatest, the union of the Particles will be in a great measure hinder'd; and therefore the Particles that unite first, are such as have the strongest attractive force, and such as have the least, are the last in uniting. The Particles endowed with the strongest attractive Powers, are, by his 2d Prop. the most Solid and Spherical Corpuscles; and their quantity of Contact being the least, the Secretion they compose must be the most Fluid: Such is the Liquor in the *Pericardium*.

Upon the same Principle, he gives the Reason of the situation of the Kidneys so near the Heart, that the Salts that are in Urine, being strongly attractive, and uniting
closely

close'y with the watery Fluid, may quickly be drawn out from the Blood. The Corpuscles which are slowest in uniting, must be such as have the weakest attractive Force; which by his 2d Prop. are such as have the least Solidity, but their Surfaces most extended; and therefore Corpuscles, which have plain Surfaces, are longer in uniting than the Spherical ones; but when united, they cohere most strongly by his 9th Prop. and compose the most viscid Fluids: Such are the Mucilages of the Joints, which are separated at the greatest distance from the Heart.

Tho' the Secretion of the Gall by the Liver, and of the Seed by the Testicles, may seem to be considerable Objections against this Doctrine, yet there is really nothing that more illustrates and confirms it than the manner of forming these Secretions. Had the Blood been immediately convey'd by the Celiac Artery to the Liver, it is evident, that on the account of the nearness to the Heart, and the Intestine motion of the Blood, that so viscid a Secretion, as the Gall is, could never have had time to have been formed in the Blood, and discerned in that place; and therefore here Nature is forced to change her constant Course of sending Blood to all Parts by the Arteries, and forms a Vein, by which the Blood is derived to the Liver from the Branches of the Mesenterick and Celiac Arteries, after it has passed through all the Intestines, Stomach, Spleen, Caul, and Pancreas. By this extraordinary contrivance, the Blood is brought a great way about, before it arrives at the Liver; and its Velocity being extremely diminished, the Corpuscles will have time to unite and form the Gall: And here our Author calculates the Velocity of the Blood that comes into the Liver, and proves, that what comes by the Mesenterick Artery, into the Porta, moves 177 times slower in the Branches of the
Porta

Porta than in the Trunk of the Mesenterick Artery, and the Blood which comes from the Spleen to the Liver, moves 200 times slower in the Spleen than in the beginning of the Splenic Artery; and from thence deduces the long stay for Uses of the Spleen and Porta: So productive is one simple truth of many others.

There is another contrivance for diminishing the Velocity of the Blood in the Testicles, which the Author explains, and shows that the Blood must be 150 times longer in passing to the Testicles the way it does, than if it had gone according to the common Course of Nature. After this the Author proceeds to explain the ways of forming other Secretions, as the . . . of the Ear, the Lymph, and Animal Spirits. He shows likewise, how from the Doctrine of Attraction the Operation of Medicines, which alter the quantity of Secretions, may be explained; for Medicines that encrease the quantity of any Secretion, operate by uniting to and augmenting the Attractive force of the Particles, that compose the Humours to be secreted, which may be more effectually done by the Particles of one sort of Medicine than those of another, and therefore different Humours will require different Purgatives to carry them off through the Glands of the Intestines; which Consideration will re-establish the Doctrine of Specifick Purges, which was confirm'd to the Antients by Experience and Observation, but rejected by the Moderns thro' a false Philosophy.

He proceeds after this, to show how necessary the Doctrine of Secretion founded on Attraction is, for the understanding of the Nature of Diseases; and gives us an example in a Diabetes. He likewise explains from it some of the Symptoms of Rheumatisms, Gout, and Stone; as also the Operations of Medicines in the Humane Body, especially the attenuaters and thickeners of the

the Blood, but more particularly the Power of Mercury in the Cure of a Gonorrhœa or Pox; which are all so easily explained by the attractive power of Matter, that now no body can doubt of the truth of a Principle so simple, which yet like a Master Key, opens the Works of very different contrivances, and discloses an Uniformity in all the Operations of Nature: So that every one may see and read the same thought and hand in the contrivance and framing of every part of the Universe.

Having given us the Method by which the several sorts of Fluids are formed in the Blood before they are separated from it, he then explains the way by which these Liquors are secreted by the Glands, and he proves, that the Orifices of all the Glands must be circular, and that they can only differ in magnitude; and therefore all the Particles that arrive at the Orifice of any Gland, and are of a less Diameter than that of the Orifice, will enter the Gland: So that if there were no other contrivance in it, the Fluid which contains the biggest Particles, will likewise consist of all the Particles of the other Secretions; but this inconveniency is obviated, by imagining several Tubes to arise from the side of the Canal or Duct of the Gland, whose Orifices are of such Dimensions, that they will admit only Particles, which are smaller than those that are to be secreted by the Gland; and a great many of them arising from the sides of the Canal, throughout its whole Circumvolution, will carry back to the Blood the Particles which are of a less Diameter than those have, which are to be discerned; so that there will at least remain in the Gland only these Particles, with such a proportion of the watry Fluid, as is necessary for the proper fluidity of the Liquor to be secreted.

In the Discourse on the quantity of Blood, he proves that the common Opinion that there are but 15 or 20

Pounds of Blood in the Body, is founded on no good grounds; they supposing that when an Animal bleeds to death, that all the Blood in the Body runs out of the Wound, which the Author shews to be false; for the larger the Vessel that is wounded is, the sooner must the Animal dye; and if the *Aorta* it self were cut a-sunder, there would be a less effusion of Blood from it, than from a small Artery: And from this he explains the true reason of fainting on any sudden or violent Evacuation, as in Bleeding in the Arm, Copping in an Ascites, &c.

By Blood he understands not only the Fluids in the Veins and Arteries, but all the circulating Liquors in the Body, they being all parts of the Blood, and separated from it by the force of the Heart, and many of them by the same force returning again: And in order to estimate its quantity, he supposes that the whole Body is nothing but Tubes or Vessels full of Blood or Liquors derived from it; and then according to the various proportions of the thickness of the Coats of the Vessels to their Cavities, he calculates what the quantity of Blood must be; and finds, that if the Body weigh 160 Pounds, it must at least contain 100 Pound weight of Blood.

He next considers the Velocity of the Blood, and determines it. And first he determines the swiftness by which it is thrown into the *Aorta*, which he finds to be such as will make it move 52 foot in a Minute; and because the sum of the Section in the Branches of an Artery is always greater than that of the Trunk, the Velocity of the Blood must constantly decrease as the Artery branches. And according to the various proportions which the Branches bear to the Trunk, he calculates the Velocity at the extremities or evanescent Arteries, and finds that if the Trunk did always bear the proportion to the Branches of 41616 to 43506, the
Blood

Blood would move at least four times slower in the extremities than in the great Artery. But if the proportion of the Trunk to the Branches were always 41616 to 52126, which is frequently observed, the greatest Velocity of the Blood will be to the least as 10000 is to 1.

In his Discourse on Muscular Motion, he proves that the Vesicles of each Fibre in the action of a Muscle are inflated by the rarefaction of the Blood and Spirits within their Cavities ; and explains the cause of this Inflation and Rarefaction from the Principles of Attraction : And then he shows, by increasing the number of Vesicles, and diminishing their bigness, the swelling of the Muscle may be made so little, as to be unperceptible, and the expence of Spirits very much lessened, and yet there will be the same degree of Contraction in the Muscle.

He then proceeds to determine the force of the Elastic Fluid, and its Proportion to the weight that is to be raised, according to the various degrees of Inflation : His Demonstrations here are founded on the same Principles with those of Mr. *John Bernoulli*, but more easy, and suited to the Capacity of those that are not versed in the deep parts of Geometry.

L O N D O N :

Printed for *H. Clements*, at the Half-Moor in St. Paul's Church-yard. MDCCIX.

ԽՍՂԱՀՈՒԹ . . ՉՃՎԺ . ՍՆԴԷ;
 ԲՄՃԿՍՄԺ . ՂԼԷՃԿՍՍԿ . Ս
 Բ Ն Ձ Յ Պ Ձ Ճ . . * . .
 * Մ Շ Ս Ն Ս Ն . . Ղ Ս Օ Ճ Խ

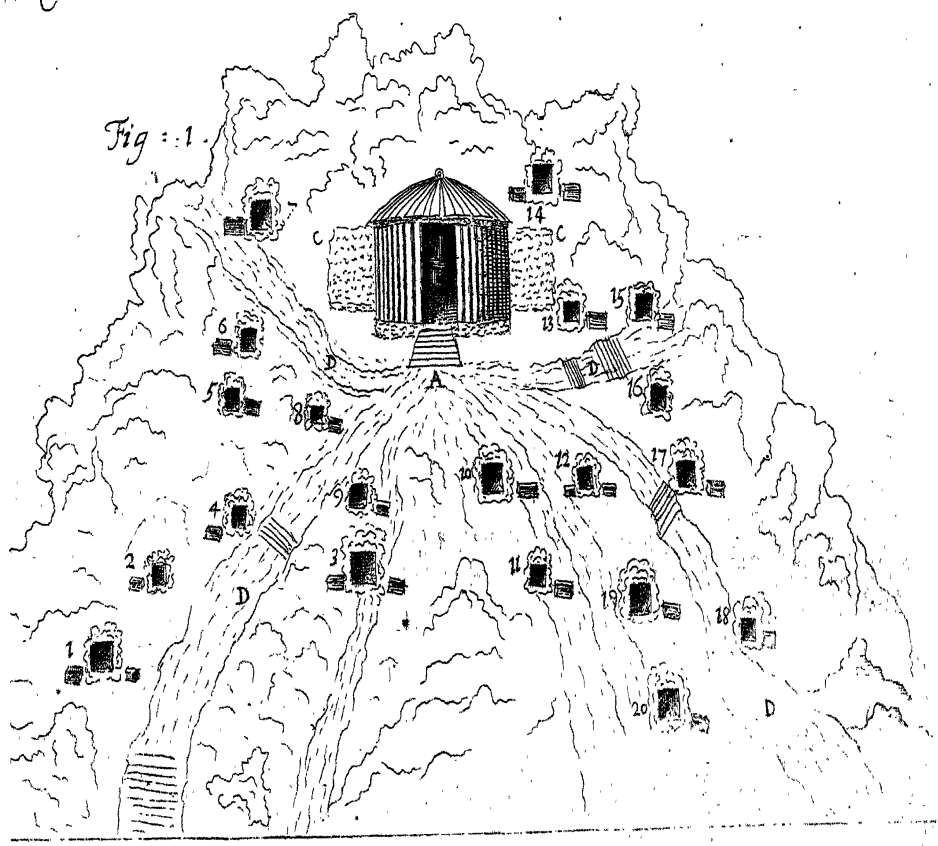
Fig : 2 .

ՆՅՈՒԺԻՄ ՄԳ
 ԴՍԸ . ՍՍԳ
 ՆՃԻՄՈՒՍՄՅԷԼԿ
 ՄՆԿԱԼԷ . . ՍՍԻՄԻՍ
 ԶԷԺՅԻՄՁՅԺԼՍԻՆ
 ԴՍՅՍՆՆՅՅԻՍՆՅԵԼ
 ՆՍՍ ԵՐՍՆՅՅՍՂՅՅԻՍ
 ՄՄՆԻՅԻՄՅՅԻՍ . ՕԼՍԵ
 ԴՍԸԳՅՍՍՍՅՅԻՍ
 ՍՃՍՍՍՍՍՍՍՍՍՍՍՍ
 ԻՆՍԸԺ . ՍՍՅՅԺ . . ԸԸԸԸԸԸ



F U

Fig: 1.



PHILOSOPHICAL TRANSACTIONS.

For the Months of May and June, 1709.

The CONTENTS.

- I. **T**ables of the Barometrical Altitudes at Zurich in Switzerland, in the Year 1708. observed by Dr. Joh. Ja. Scheuchzer, F. R. S. and at Upminster in England, observed at the same time by Mr. W. Derham, F. R. S. as also the Rain at Pisa in Italy in 1707. and 1708. observed there by Dr. Michael Angelo Tilli, F. R. S. and at Zurich in 1708. and at Upminster in all that time: With Remarks on the same Tables, as also on the Winds, Heat and Cold, and divers other Matters occurring in those three different Parts of Europe. By Mr. W. Derham, Rector of Upminster.
- II. An Account of an Experiment, shewing that actual Sound is not to be Transmitted through a Vacuum. By Mr. Fr. Hauksbee, F. R. S.
- III. ~~An~~ Account of an Experiment, touching the Propagation of Sound, passing from the Sonorous Body into the common Air, in one Direction only. By Mr. Fr. Hauksbee, F. R. S.
- IV. An Account of an Experiment touching the Propagation of Sound through Water. By Mr. Fr. Hauksbee, F. R. S.
- V. An Explanation of the Figures of a Pagan Temple and unknown Characters at Cannara in the Island of Salsette in the East Indies. By Mr. Alexander Stuart.

I. *T A B L E S of the Barometrical Altitudes at Zurich in Switzerland in the Year 1708. observed by Dr. Joh. Ja. Scheuchzer, F. R. S. and at Upminster in England, observed at the same time by Mr. W. Derham, F. R. S. as also the Rain at Pisa in Italy in 1707. and 1708. observed there by Dr. Michael Angelo Tilli, F. R. S. and at Zurich in 1708. and at Upminster in all that time: With Remarks on the same Tables, as also on the Winds, Heat and Cold, and divers other Matters occurring in those three different Parts of Europe. By Mr. W. Derham, Rector of Upminster.*

IT being the Pleasure of our most illustrious Society, to put into my hands (according to Dr. *Scheuchzer's* desire) his Observations of the Weather, &c. made at *Zurich* in the Year 1708. and having also my self received from Dr. *Mick. Angelo Tilli* the quantity of Rain which he observed to fall at *Pisa*; I have accordingly compar'd these Observations with mine made at the same time at *Upminster*. And to represent them the better at an easy view, I have put what I could of them into the annexed Tables. In the former of which, I have represented Dr. *Scheuchzer's* and my Barometrical Observations: In the later, his Rain Observations, those of Dr. *M. A. Tilli*, and mine own; all reduced to the same, that is, our English measure, - that they may the more easily be seen and compar'd together. But because I have not

certain of the true Proportion between the *Tuscan* and *English* weight, I have therefore given Dr. M. A. Tili's Rain, both in the *Tuscan* Pounds and Ounces as he sent it me; as also reduced to our *English* Troy-pound and Centesimals of that Pound, according to Mr. Greaves's proportion, which is different from that assigned by Sir *Jonas Moor*.

As to Dr. *Schenckzer's* other Observations of the Winds, the Weather, the Thermometer, and divers other very curious and remarkable Matters, I have not inserted them into particular Tables, because these following general Remarks may in some measure supply that defect.

I. For the *Thermometer*. It would have been in vain to have compared his Observations with mine, by reason we have not yet a Standard for Thermometers, as we have for the Barometers; they being every where in all, or most respects different; some with large, some with small Bottles of Spirits; some accordingly with longer, some with shorter; some with wider, some with narrower Canes, or Shanks; some filled with more highly rectify'd, and consequently more expansive Spirits, some with more phlegmatick and duller Spirits.

The difference particularly between Dr. *Schenckzer's* and my Thermometers, his is about one Foot long; that I observed with all along (till it was broken this Year) about two Feet and a half; and that I now observe with, three Feet and a quarter; the bore of the Stalk is small, and the Ball is large, and consequently the Rang great, answering every the least alteration of Heat and Cold.

But yet thus much I have been able to observe by comparing Dr. *Schenckzer's* and my Thermometrical Observations, viz. That notwithstanding the *Alpine* Snows have mighty Effects on the Weather in *Switzerland*, and other conterminous Places, yet there is much more agreement between the Heats and Cold at *Zurich* and *Upmünster*, than

than before comparing them, I imagined. (I speak with relation to last Year only, having no other Observations.) For in Winter, although I imagine we have more warm days than they; and in Summer, that they have greater Heats than we; yet I observe that the Colds and Heats in both Places, begin and end nearly about the same time: Yea, that oftentimes any remarkable Weather (especially if of somewhat long continuance) affecteth one as well as the other place. Thus for instance, *June*, which was (some part of it at least, particularly the very day after the Solstitial-day, *June 12.*) remarkably Cold in *England*, seems to have been not very different at *Zurich*; Dr. *Scheuchzer's* Thermometer divers times that Month (though not on the very same days perhaps) descending as low, or rather lower than in the Month before, yea as low as many days in the Winter Months. But one thing I farther observed was, that all this Month their cold Weather constantly preceded ours here about five or more Days. *An Indication that (as shall be farther observed hereafter) the Weather, in both Places was influenced by the same Causes, whether the Alpine Hills and Cold, or the Influence of the Stars and other heavenly Bodies, or any other Cause, I shall not enquire.

—And as in *June* there was a great agreement in the unusual Cold, so in *August* there was not much less agreement in Heat; the Heats in both places being great, and beginning to abate about the same time, only a little sooner here than there.

In Winter also, although, as I said, I imagine we have a greater number of warmer Days than they, yet I find that a warm Winter Month there is so here; and a cold one there is a cold one here likewise. Thus in *February*, *March*, *October* and *November*, a great agreement seems to be observed between the Heats and Colds of both Places, some Days excepted. But *January* was at the same time not so constantly Cold, for the Season of *January*, as

it seems to have been at *Zurich*. And *December* last, which from the 8th Day to *Christmas*-day, was here moderate and open Weather, and after that more intensely Cold than even in the *Long-Frost Anno* 1683. by the fewer Thermometrical Observations which *Dr. Scheuchzer* made then, than in other Months, the greatest part, I say, of that Month seems to have been intensely cold at *Zurich*, as the later part thereof was with us remarkably in *England*.

Thus much for the *Thermometrical Observations*. The

II. Remark I shall make, shall be of the *Winds*: Which also I did not enter into Tables, because it may be sufficient to observe in general, That although many Days they agree in both places, yet there are many more in which they differ. When they do agree, I find it is chiefly when the Winds are strong, and of long continuance; And more I think when Northerly and Easterly, than in the other Points. Also I have observed, That a strong Wind in one place hath been a weak one in the other.

III. As to the *Barometrical Observations*, I have thought it worth while to specify them. Mine own Observations I selected which were made at Noon; and *Dr. Scheuchzer's* as near Noon as might be. - For which reason I commonly took his Morning Observations, because made for the most part about 10 or 11 of Clock. Also I took those made with his Bent-Barometer; because they seemed to me (especially at the beginning of the Year) to be the most accurate.

The Altitudes of his Mercury he measureth by the *Paris* foot, which I have reduced to our *English* measure, that they may be at an easy view compared with mine:

For which reason I have also all along noted their Differences.

It is manifest from the Tables, That throughout the whole Year, the Mercury was lower at *Zurich* than at *Upminster*, by sometimes one, sometimes above two Inches *Engl.*. The most remarkable difference was at the latter end of *September* and beginning of *October*, when the difference was for a good while above two Inches *Engl.*. The reason of which, I guess, was because at *Zurich* I imagine the Air was more enclined to wet, at that time, than at *Upminster*; as also because the Winds then were Northerly and Easterly with us; which, 'tis well known, do make our Barometers rise, even in wet Weather. But the mean difference between Dr. *Schenckzer's* and my Barometers, I take to be about half an Inch *Engl.*. From whence I conclude, That the Situation of *Zurich* is near a Quarter of an *Engl.* Mile higher than that of *Upminster* above the surface of the Sea; or else that that part of the Terraqueous Globe, lying nearer the Line, is (according to the received Opinion) higher, or farther distant from the Center, than ours is, lying nearer the Pole.

Farther. It may be observed from the annexed Barometrical Tables, That (as near the Equinoctial the Barometer is observed to stand nearly at a stay, but the more Northerly the Latitude, the greater the rang of the Mercury, so) at *Zurich* the difference (last Year) was not so great between the highest and lowest stations of the φ , as it was either at *Paris* or *Upminster*. For at *Zurich* the difference was only one Inch *Paris*-measure; at *Paris* Dr. *Schenckzer* saith it was one Inch two Lines and an half; but at *Upminster* it was 1.8 Inch, (and some Years 'tis more) which is greater than either of them.

The last thing which I shall take notice of relating to our Barometrical Observations is, That I observe although there

there be some, and that a pretty deal of agreement between the rising and falling of our Barometers, one being very often high or low, when the other is so; and one oftentimes rising or falling when the other doth so; and one rising much or little, or falling much or little when the other doth: I say although the matter is often thus, yet it is not so certainly so, as it is nearer home. In our *Philos. Transf. N. 286.* I have given a Table of some Heights of the Mercury observed at *Upminster*, and at 200 Miles distance in *Lancashire* at the same time. And in the *Hist. de l'Acad. Roy. des Scien. Anno 1699.* Monsieur *Meraldi*, by comparing his Observations at the *Paris Observatory* with mine at *Upminster*, takes notice, "That there is a great agreement between the variation of the Heights of the Barometers in both Places; that he finds almost always that when one riseth or falleth, the other doth so too, although not always alike: That the Days in each Month whereon the Mercury hath been highest or lowest, it hath been the same at *Paris* as at *Upminster*, but ordinarily somewhat more than 3 or 4 Lines lower at *Paris* than *Upminster*." But the Agreement between the Variations of Dr. *Scheuchzer's* Barometers and mine, although I say often great, yet is not so constantly, nor so certainly great as nearer home, viz. at *London, Lancashire, Paris*, and other places, with which I have made the comparison.

IV. The next Remark I shall make, shall be on the *Tables of Rain*, observed at *Pisa in Italy*, by Dr. *Mich. Angelo Tilli*, Botannick Professor there; and at *Zurich in Switzerland*, by Dr. *J. J. Scheuchzer*; both very ingenious, curious, and diligent Members of this learned and honourable Society; and lastly, by my self at *Upminster in Essex*. The *Italian* Observations were procured

for me by the Society, as well as my illustrious Friend, Dr. Newton, Her Majesties very ingenious and learned Envoy at Florence, and a very useful Member of this Society.

1. The first thing that in these Rain-Tables represents it self to our view, is, That the Rains for the most part are more frequent at *Upminster* than either at *Zurich* or *Pisa*; I mean We have more Rainy Days than They. But yet

2. The Rains in both these Places are much greater in Quantity, in the whole Year, and in some Months, especially the Autumnal and Winter Months, than our Rains are at *Upminster*. *May, June, and July*, and a great part of *August* in 1707. seem to have been very dry, and I suppose searching Months at *Pisa*, as in some measure some of them were here: And in that time less Rain fell there than here. But the following Autumnal Months made, at *Pisa*, sufficient amends, either by the great quantity that fell at a time, I suppose in Thunder, and such like hasty large Showers; or else by the Quantity and Frequency both. What a prodigious Quantity was that, for instance, of above 32 pounds on *August 19*? (if it all fell on that, and not some on the preceding days.) But we find very large Quantities at a time to have fallen on divers Days, where it is manifest the Rain was weighed every Day, viz. 10 Pound, 9 Pound, and other large Quantities for several Days together, in the cooler autumnal Months. But as the Weather groweth warmer, I imagine their Rains at *Pisa* are fewer; and what falleth, falleth in large quantities. For which reason the quantity of Rain in the Spring-months of *March, April, and May* 1708. (sometimes dripping Months in *England*) is nearly the same both at *Pisa* and *Upminster*.

As to the Rain at *Zurich*, I observe, That although their Rains are less frequent than ours in *Essex*; yet they seem to be more frequent than theirs at *Pisa*: but the quantity at *Zurich* is greater than at *Upminster*, and less than at *Pisa*.

'Tis Dr. *Scheuchzer*'s Opinion, "That more Rain falleth in *Switzerland* than in *France*, at *Zurich* than at *Paris*. To confirm which he giveth us this Table of eight Years Rain at *Paris*, to which I shall add mine for *Upminster*.

The Rain at Paris in 8 Years.					At Upm	
The Year.	Depth in Lines of Paris measure.	Depth in Inches of Paris measure	Depth in English Inches & Centes	Depth in English Inches and Centesim.		
1699	224	$\frac{1}{4}$ 18 8 $\frac{1}{4}$	19 93	15	11	
1700	240	$\frac{1}{2}$ 20 $\frac{1}{2}$	21 37	19	02	
1701	256	$\frac{1}{4}$ 21 4 $\frac{1}{4}$	22 77	18	62	
1702	196	$\frac{1}{4}$ 16 4 $\frac{1}{4}$	17 45	20	38	
1703	208	$\frac{1}{4}$ 17 4 $\frac{1}{4}$	18 51	23	99	
1704	238	$\frac{1}{2}$ 19 10 $\frac{1}{2}$	21 20	15	80	
1705	166	$\frac{1}{4}$ 13 10 $\frac{1}{4}$	14 82	16	93	
1706	183	$\frac{1}{2}$ 15 3 $\frac{1}{2}$	16 31	24	29	
Total Depth		142 10 $\frac{1}{4}$	152 36	154	22	

It is manifest from this Table, That the *Zurich* Rain last Year (although it amounted not to the Quantity which fell at *Pisa* in a whole Year, yet) exceeded both the *Paris* and *Upminster* annual Rains of 8 Years before. But whether it constantly doth so or not, if God spare them Life, the future Observations which Dr. *Scheuchzer* and Dr. *Tilli* promise us will demonstrate.

But before I quit my Remarks on this last Table, 'tis necessary that I take notice, That there is a greater difference

rence between these last 8 Years Rain at *Paris* and *Upminster*, than I found in the 8 Years, in which I formerly compared the Rain of *Towneley*, *Paris*, *Lisle*, and *Upminster* together, in *Philos. Transf. N. 297*. For by that comparison it appeared, that less Rain fell at *Upminster*, than at either of the other three Places. But according to these later 8 Years in the Table, a small matter more falleth at *Upminster* than at *Paris*. For the mean Proportion for *Paris* (which according to former Years was above 20 Inches *Paris* measure, or 22 Inches *English*) is according to these last 8 Years no more than 17 Inches, 9 Lines, *Paris*-measure, or 19 Inches *English*: And *Upminster*-Rain, which I formerly computed at, Year for Year, about 20 Inches and an half *English*, is for these 8 Years much the same, or a little more than that at *Paris*.

The Proportions therefore which I shall now lay down for the yearly Rain of all Places, whose Rain I have had Information of, are these; for *Zurich* (till farther Observations are made) $32 \frac{1}{2}$ Inches; for *Pisa* (till farther Observations also) $43 \frac{1}{2}$ Inches; for *Paris*, 19 Inches; for *Lisle*, 4 Inches; for *Towneley* in *Lancashire* $42 \frac{1}{2}$ Inches; for *Upminster* $19 \frac{1}{4}$ Inches; all the same, that is *English*-measure.

3. The last Observation I shall make upon the Rain Tables is, The great use of Cold to the making of Rain. That Exhalations and Vapours are the matter of Rain, is not to be doubted. And how they are raised, whether according to the learned and ingenious Dr. *Woodward's*, or any other Hypothesis, I shall not enquire. It is sufficient for my present purpose to say, That when those Vapours are raised, they are constipated and condensed into Clouds and Rain, chiefly by the Cold of the Air to which they are elevated. And the greater the quantity of Vapours raised is, and withal the more intense the Cold of those airy Regions, the greater is the quantity of

of Rain. This although probably a matter well known and scarce doubted, yet may deserve special Consideration, because it will lead me to divers observables. Now this is manifest from the annexed Tables compared with Dr. *Scheuchzer's* and my Weather, &c. Observations. Thus for instance *January*, which Dr. *Scheuchzer* frequently observed was sometimes warm, sometimes cold, and appeareth farther to have been so by his Thermometrical Column, and which was the same with us in *South-Britain*, that Month, I say, had plenty of Rain at *Zurich*, *Upminster*, yea, and *Pisa* too. The same might be said of *February* for *Zurich*, and probably *Pisa* too. So also for *December* in 1707. at *Pisa* and *Upminster*; and *December* last at *Zurich* and *Upminster*. But with us *February* was for the most part a cold Month, and the Rain the less, by reason the Vapours either could not be raised in plenty enough, or not be carried high enough, or suspended long enough to be united, but soon were precipitated back again to the earth.

From these Causes assigned, the plenty of Exhalations and Cold of the airy Regions, I conceived it is, that at *Upminster*, about the Equinoxes, we have often more Rain than at other Seasons. But I cannot say this is certain and constant. Thus it was at the Autumnal Equinox in 1707, not only at *Upminster*, but at *Pisa* too: So at *Zurich*, *Pisa* and *Upminster* about the Vernal in 1708. and at *Zurich* and *Upminster* the last Autumnal Equinox. And this very 28th of *March* 1709. whilst I am writing this, I have a pregnant Proof of what I am saying. For not only the unusual Cold of the Winter hath been succeeded by as unusual quantities of Rain all this Month; but at this very time the Weather is open, but withal cool. Particularly *March* 26. many Vapours arose, so as to fill the Air with a warm stinking Fog. The Night following a smart shower of Hail fell, a manifest indication of the Cold of the middle, or top of the lower Region of the

the Air. And the day after, *viz.* March 27. proved so wet a day, that almost 5 pound of Rain fell through my Tunnel, a large quantity for the compass of 12 Inches Diameter in 14 or 15 hours time. The Wind and Clouds were all the while calm and still, and frequently changing from Point to Point, near round the whole Compass; and the Rain that fell, fell thick, in small drops. Which makes me think, that the warm foggy Vapours, raised in great plenty the day or two before, as soon as they were mounted aloft, met with suddain extreme Cold of the middle Region, and were thereby hastily condensed, and the Air being at the same time very light (the Barometer being then very low) they speedily tumbled down in small and thick Drops of Rain.

And this I take to be the very case of the vernal and autumnal Rains already mentioned, *viz.* In Spring, when the Earth and Waters are loosed from the brumal Constipations, the Vapours arise in great plenty. So also in Autumn, when the Heats that dissipated them in Summer, and also warmed the superiour Regions, are abated, the Vapours raised then in great plenty are soon condensed by the Cold of the superiour Regions, and so are forced down in more plentiful Rains than at other Seasons, when either the Vapours are fewer, or Cold of the superiour Regions less.

For a farther proof, or at least illustration of what hath been said, let us again cast an Eye upon *June* last, a Month as unseasonably wet, as 'twas unusually Cold. The Cold thereof I have already taken notice of; and the wet Weather accompanying it was so unseasonable to us in *South-Britain*, that although we had great and welcome Crops of Hay after a great scarcity the preceding Year, yet we had scarcely any good Weather to make it in. So Dr. *Scheuchzer* saith it was with them in *Switzerland*, in his Remarks on that Month: *Fuit hic mensis, ut ex pluvia mensurata constat, præter modum humidus, & mag-*

ther at *Zurich* the Cold was more excessive, than it used to be in other Years, Dr. *Scheuchzer* doth not say; but he noteth the Air to have been excessively Cold, and his Thermometrical Observations shew it to have been so some time before, in, and after *Christmas*. And Dr. *Newton* in a Letter he honoured me with lately from *Florence*, saith, “ The Cold was there so great, that for twenty “ Years past they had not been sensible of greater; it “ wanting on *Twelfth-day* but half a Degree of the Extreme mi y. Their *Twelfth-day* I reckon fell on *December 26*. O. S. and consequently their so eminently Freezing day preceded ours about four Days.

And as their Cold, so by Dr. *Scheuchzer*’s Observations, I find the Relaxation thereof preceded ours a short time. For about the later end of *December* the Weather appears to have been milder, at least less intensely Cold with them. And so was ours at the beginning of *January*, about as many days after theirs, as their Cold preceded ours.

Thus I have given one eminent Instance of what I found lesser Examples frequently, as I run over Dr. *Scheuchzer*’s last Year’s Observations. But whether there may be any farther Reasons for any such Conclusions about the Influences of the Alpine Eminences and Colds upon far distant places, future Observations will I hope determine. But as to their Influences nearer home, Dr. *Scheuchzer* saith, *Alpes fecunda mater sunt, ut Fluminum & Nubium, ita quoque Nivis & Pluviae. Credibile omnino est, loca Maris, Alpibusque viciniora, plus etiam experiri Pluviae præ remotioribus aliis.*

To these Remarks I might add Dr. *Scheuchzer*’s Observations of the Occurrences in each Month of what was curious as to Meteors, the State of Health and Diseases, &c. also the increase and decrease of their *Zurich River*, the *Limat*, which (like other Rivers that have their Source in the *Alps*) he puts beyond all doubt (in my Opinion) to receive

receive greater Increments from the melting of the *Alpine* Snows, than from all the wet proceeding from their *Rails*. But as I have been long already, these things would add more to the length of what I have said; and therefore I shall rather chuse to refer to his Observations at large, than injure them by an Abridgment.

Here I was putting an end to my Remarks, but in the same moment I received Letters from the before-commended Dr. *Newton* from *Florence*, and Dr. *M. A. Tilli* from *Pisa*. In the later of which are some Observations that so directly relate to what I have before taken notice of, that I must beg Pardon for a small Addition to what I have said.

Dr. *Tilli's* half Year's Rain coming too late, I have put it alone in the additional Table. From which Table compared with the foregoing Tables it appears, that although, in the Year before, *June* and other Summer-Months were dry, yet last *June* was a wet Month at *Pisa*, as well as *Zurich* and *Upminster*, and so likewise was it about the Autumnal Equinox: and for the same Reasons, I imagine, which I have already mentioned.

As to the Excess of the *Pisa-Rain* above that of other Places (concerning which I wrote to Dr. *Tilli*) he attributeth it to the same cause (he saith) that I did that of *Lancashire*, namely, the Height of the Hills, and the Blowing of the Winds for a long time from some one Quarter. His Observation is this, *Libenter admitto Pluviam nostram semper, vel ut plurimum vestram superare, ei sane ratione ut animadvertisti; & præcipuè si aspera Cælica juga, autumnî tempore, nive citò cooperiantur: Tunc Australes venti diu vigent & Imbres. Aquilonares verò frequentius circa Florentinos coeles, quàm circa Pisanam urbem spirare planè constat. Est enim hæc civitas a Boreâ circumdata montibus, & pari intervallo circa milliarîa quinque distat a mari.*

The same Account of the Situation of *Pisa*, and the great quantity of Rain falling there, I remember I had some

time here from a very ingenious Member of this Society. Mr. *Aston*, who hath been there; who witness'd added (if I must be true) that *Pisa* was for that reason called, or might be called, *The Piss-pot of Italy*.

But what is mentioned. there are in the Letters of those ingenious Gentlemen divers other things, some of them relating particularly to this last Winter's remarkably severe Frost in *Italy*. but these with some other Accounts relating to the same subject, as they may be more useable, to attend them for the Societys Diversion and Service (if God spare a little life and leisure) in a future time.

Just as I was putting a finishing Hand to this, I received from *Dublin*, Mr. *Molyneux's* Observations there of the Weather, Winds, Rain, &c. during the last Year. As soon as I am sorry arriv'd no sooner, that they might have been seen together with the foregoing Observations. But it being now too late, I shall take some other, though less opportune time, to acquaint this most illustrious Society with them.

A Table shewing at an easie View the Heights of the Mercury in the Barometer in English Lines and Inches of an Inch, both at Zurich in Switzerland, and at Exminster in South-Britain, together with the Differences of those Heights, throughout the Year 1708.

January.				February.			
D. of Mo.	Zurich in Engl. Inches.	Upm. in Engl. Inches.	D. per. in Engl. Lines.	D. of Mo.	Zurich in Engl. Inches.	Upm. in Engl. Inches.	D. per. in Engl. Lines.
1	28	1	29	4	1	2	18
2							29
3	17		14				52
4	26		4				5
5	17		42				1
6			28				25
7	17		4				3
8	27	99	5				44
9	64	28	76				3
10	4		50				12
11	46		97				1
12	99	29	28				20
13	72		2				2
14	7		11				3
15	27	9	28				6
16			99				14
17	28	17	29				20
18			8				29
19	27	90	29				32
20	40		15				33
21							36
22	81	28	80				25
23	73		95				8
24	99	29	12				47
25	90		20				4
26							17
27							25
28	81		57				15
29	81		95				27
30							95
31	23	8	76				

March.					April.				
1. of	2. 12.	3. 12.	4. 12.	5. 12.	1. of	2. 12.	3. 12.	4. 12.	5. 12.
1	27 90	29 22	1	2	23	28 97	3	97	
2	23	23	1	23	27 95	94	0	99	
3	27 85	42	1	57	9	29 28	1	38	
4	85	64	1	83	81	53	1	72	
5	28	73	1	73	90	45	1	55	
6	15	44	1	32	85	65	1	80	
7	6	73	1	67	90	65	1	75	
8	27 81	30 12	2	21	24	50	1	50	
9	81	29 46	1	65	00	60	1	60	
10	85	18	1	33	27 61	62	1	98	
11	75	30	1	55	75	77	2	2	
12	81	50	1	69	72	62	1	90	
13	85	59	1	74	90	80	1	90	
14	85	45	1	60	28	91	1	91	
15	28 6	37	1	31	6	89	1	83	
16	13	47	1	34	8	88	1	80	
17	8	52	1	44	27 95	92	1	98	
18	27 90	33	1	43	95	85	1	90	
19	28 6	21	1	15	28	89	1	89	
20					6	80	1	82	
21	27 85	34	1	49	6				
22	72	8	1	36	8 30	1	92		
23	72	13	1	41	00	29 80	1	80	
24	85	6	1	21					
25	81	24	1	52	8	80	1	70	
26	75	29	1	54	12	85	1	73	
27	85	10	1	31					
28	28 4	38	1	34	6	76	1	70	
29	27 90	37	1	47					
30	95	6	1	11	00	37	1	37	
31	28	14	1	14					

May.

May.					June.						
No.	Zurich of Engl. in be.	Ulm, in Engl. Inches.	No.	Zurich of Engl. in be.	Ulm, in Engl. Inches.	No.	Zurich of Engl. in be.	Ulm, in Engl. Inches.	No.	Zurich of Engl. in be.	Ulm, in Engl. Inches.
1	28 0	29 53	1	53	27 95	29 65	1	70			
2	6	6	1	63	28 6	55	1	49			
3					27 9	50	2	5			
4	8	50	1	42	82	30	7	2			
5	0	44	1	44	85	29 90	2	1			
6	8	41	1	33	90	60	1	75			
7	6	36	1	10	28 8	52					
8					27 90	50	1	60			
9	26	62	1	35	90	50	1	60			
10	12	63	1	51	28 0	50	1	50			
11	0	46	1	46	27 90	58	1	60			
12	27 90	66	1	76	28 0	59	1	53			
13	81	79	1	98	27 81	36	1	55			
14	75	83	2	8	85	39	1	60			
15	72	68	1	96	90	60	1	70			
16	54	66	2	12	85	47	1	60			
17					28 5	40	1	50			
18	64	40	1	80	27 81	40	1	59			
19	72	58	1	86	81	47	1	66			
20	90	74	1	84	85	73	1	88			
21	28 0	81	1	81							
22	0	59	1	59	90	70	1	80			
23	27 95	54	1	59	97	70	1	75			
24	28 8	67	1	59	85	43	1	50			
25	17	80	1	60	90	45	1	40			
26	15	86	1	71							
27	27 85	84	1	99	72	81	2	1			
28	28 8	81	1	73	73	99	2	26			
29	0	87	1	87	72	98	2	26			
30	0	84	1	84	75	80	2	5			
31	27 90	78	1	78							

July..

July.				August.			
D.	Lunich in Engl inches.	Upm. in Engl Inches.	Differ. in Engl Inches.	Lunich in Engl inches.	Upm. in Engl Inches.	Differ. in Engl Inches.	
1	28	29 72	1 72	27 85	30 22	17	
2	27 95	92	1 97	81	29 84	2 3	
3	97	89	1 92	85	70	1 85	
4	95	80	1 85	28 6	72	1 56	
5	28	67	1 67	10	67	1 57	
6	27 75	69	1 94	8	56	1 48	
7	81	72	1 91	0	57	1 57	
8	28	69	1 69	27 81	93	2 12	
9	8	68	1 60	85	98	2 13	
10	12	80	1 68	90	62	1 72	
11	0	84	1 84	95	66	1 71	
12	27 81	90	2 9	28 8	89	1 81	
13	93	83	1 90	0	93	1 93	
14	28 6	68	1 62	27 85	93	2 8	
15				75	84	2 9	
16				72	80	2 8	
17	27 95	63	1 68	73	55	1 82	
18	90	77	1 87	72	19	1 47	
19	28	76	1 76	90	61	1 71	
20	27 72	84	2 12	95	81	1 86	
21	28	65	1 66	72	93	2 21	
22	6	50	1 44	81	77	1 96	
23	17	56	1 39	90	93	2 3	
24	8	84	1 76	95	53	1 58	
25	6	73	1 67	28 00	51	1 51	
26				00	51	1 51	
27	27 95	82	1 87	27 95	52	1 57	
28	85	54	1 69	85	63	1 78	
29	95	66	1 71	28	51	1 51	
30	85	61	1 76	27 85	62	1 77	
31	81	96	2 15	28 6	56	1 56	

Sep-

September.				October.			
D of M.	Time in Eng. Inches.	Time in Eng. Inches.	Differ. in Eng. Inches.	u c. in Eng. Inches.	Time in Eng. Inches.	Differ. in Eng. Inches.	
1	28 6	29 58	1 52	27 72	29 92	2 20	
2	00	54	1 54	69	93	2 24	
3	17	50	1 33				
4	8	48	1 40				
5	27 72	61	1 89	72	73	2 1	
6				85	30 5	2 20	
7	72	45	1 73				
8	72	49	1 77	81	29 94	2 13	
9							
10	81	45	1 64	72	86	2 14	
11				64	86	2 22	
12	64	67	2 3	72	30 6	2 34	
13	46	48	2 2				
14	72	43	1 71	90	29 41	1 51	
15	85	28 65	0 80				
16							
17	72	29 30	1 58	87	79	1 92	
18	69	67	1 58	28 6	59	1 53	
19				00	49	1 49	
20	72	88	2 16	27 72	70	1 98	
21	75	86	2 11	72	30 00	2 28	
22	75	85	2 10	90	22	1 12	
23	75	96	2 21	95	29 76	1 81	
24	81	30 20	2 39	95	74	1 79	
25	56	17	2 61	64	89	2 25	
26	50	12	2 62	85	80	1 95	
27	64	84	2 25	81	67	1 80	
28	81	94	2 13	81	63	1 74	
29				28 00	64	1 64	
30	72	73	2 1	27 90	80	1 90	
31				28 00	73	1 73	

November.					December.				
Da. f Mo.	Zu. 104 in Engl. Inches.	Upm. i English Inches.	Dis. m English Inches.		Zu. 104 in Engl. Inches.	Upm. m English Inches.	Dis. m English Inches.		
1	28 22	30 21	1 99		28 26	29 36	1 10		
2	24	18	1 94		30	45	1 15		
3					22	50	83		
4					27 99	28 96	0 97		
5	15	6	1 91		73	92	1 19		
6	08	12	2 4		77	29 11	1 34		
7	17	29 86	1 69		85	11	1 26		
8					99	15	1 16		
9	22	30 8	1 86		28 15	24	1 9		
10	17	10	1 93		15	24	1 9		
11	22	29 78	1 56		08	28	1 20		
12					27 99	40	1 41		
13	22	30 10	1 88		90	59	1 69		
14	17	00	1 83		73	83	2 10		
15									
16	22	15	1 93						
17	26				75	74	1 99		
18					90	77	1 77		
19	22	29 88	1 66		95	52	1 57		
20					99	60	1 61		
21	22	50	1 28		28 6	61	1 55		
22					6	50	1 44		
23	27 77	27	1 50		27 99	77	1 78		
24	90	60	1 70		28 17	28	1 11		
25	28 17	84	1 67		26	36	1 10		
26					17	30 14	1 97		
27					22	28	2 6		
28									
29					17	29 83	1 66		
30	26	45	1 19		15	80	1 65		
31						49	1 32		

A Table of the Rain at Pisa in Italy, both in Tuscany, and English Troy-Weight, which fell through a Tunnel of half a Brace Square, from May till the end of December 1707: As also the quantity of Rain at Upminster in Essex at the same time, which fell through a round Tunnel of 12 Inches Diameter, in Pounds Troy, and Centesimals of a Pound.

D. of Mo.	May.			June.		
	Pisa Rain in Tuscan Weight.	Pisa Rain re- duced to Eng. W.	Rain at Upmin- ster.	Rain at Pisa in Tuscan Weight.	Rain re- duced to Eng. P.	Rain at Upmin- ster.
	l. oz.	l. dec.	l. dec.	l. oz.	l. dec.	l. dec.
1						0 17
2						2 90
3						0 05
4						
5						
6						0 55
7						
8				5 75	12	
9						
10						0 06
11						0 02
12						
13						
14						
15						0 29
16						
17						
18						
19						
20						
21						
22	0 90	69	2 70			
23			1 26			
24			0 17			0 85
25						0 42
26						
27						0 33
28						0 23
29			0 56			
30			0 56			0 81
31	Tot. w ^t	0 695	25	5 126	68	
	Dep. in Inch.	0 121	05	0 881	34	

	July.			August.		
	Pisa	Rain	Up-	Pisa	Pisa	Up-
	Rain	Rain	Up-	Rain	Rain	Up-
	Height	Eng. po.	ster.	Height	Eng. po.	ster.
	l. oz.	l. oz.	l. oz.	l. oz.	l. oz.	l. oz.
1			0 1			
2				I II	0 I	90
3			0 92			
4			0 40			0 76
5			0 25			0 09
6	2	0 I	84			3 34
7						0 16
8						0 45
9						0 81
10						
11			0 00			
12			I 12			
13			0 3			0 10
14						0 07
15						
16			0 17			
17			0 16			0 68
18	0	3	23			
19				32	5 29	75 0 10
20				I	0 I	53 I 02
21						
22			0 94			
23			0 65			
24				I	4 I	23
25						
26						
27						
28			0 92			
29			0 20			
30						0 31
31						0
32						
Total	2	7	6 37	Total	22 51	0 88
Dep. n Eng.	0	35	I 27	Dep. n	5	76 2 17

Septem

September.				October.			
Day	Temp.	Wind	Bar.	Day	Temp.	Wind	Rain or Snow
1	64	W	30.0	1	64	W	0.0
2	64	W	30.0	2	64	W	0.0
3	64	W	30.0	3	64	W	0.0
4	64	W	30.0	4	64	W	0.0
5	64	W	30.0	5	64	W	0.0
6	64	W	30.0	6	64	W	0.0
7	64	W	30.0	7	64	W	0.0
8	64	W	30.0	8	64	W	0.0
9	64	W	30.0	9	64	W	0.0
10	64	W	30.0	10	64	W	0.0
11	64	W	30.0	11	64	W	0.0
12	64	W	30.0	12	64	W	0.0
13	64	W	30.0	13	64	W	0.0
14	64	W	30.0	14	64	W	0.0
15	64	W	30.0	15	64	W	0.0
16	64	W	30.0	16	64	W	0.0
17	64	W	30.0	17	64	W	0.0
18	64	W	30.0	18	64	W	0.0
19	64	W	30.0	19	64	W	0.0
20	64	W	30.0	20	64	W	0.0
21	64	W	30.0	21	64	W	0.0
22	64	W	30.0	22	64	W	0.0
23	64	W	30.0	23	64	W	0.0
24	64	W	30.0	24	64	W	0.0
25	64	W	30.0	25	64	W	0.0
26	64	W	30.0	26	64	W	0.0
27	64	W	30.0	27	64	W	0.0
28	64	W	30.0	28	64	W	0.0
29	64	W	30.0	29	64	W	0.0
30	64	W	30.0	30	64	W	0.0

Novem-

November.				December.			
D. of Mo.	Rain at Pisa in Tuscan Night.	Pisa Rain reduced to Engl. W.	Rain at Uppin-ger.	Rain at Pisa in Tuscan Night.	Pisa Rain reduced to Engl. P.	Rain at Uppin-ger.	
	l. oz.	l. dec.	l. dec.	l. oz.	l. dec.	l. dec.	
1							
2				2 8 2	45 0	44	
3			0 33			0 65	
4							
5							
6						0 63	
7						0 25	
8				5 4 4	89		
9	48	57				0 84	
10				2 10 2	60		
11							
12				2 8 2	45 1	67	
13							
14			0 53				
15						1 24	
16				2 10 3	52 0	96	
17			0 38				
18							
19	93	44					
20				5 6 5	05 0	82	
21			0 86			1 38	
22						0 22	
23	58	64				0 25	
24	60	46 3	08				
25	42	12				0 16	
26			0 108				
27			30			0 65	
28						0 98	
29			0 10	7 5 6	80		
30						0 92	
31							
Total	2225	99					
Def. in	2227	18					

A Table of the Rain at Zurich in Switzerland, at Pisa, and Upminster, in the Year 1708. All reduc'd to the Depth in English Inches, and Centesimals of an Inch.

January.					February.				
D. of M.	Rain at Zurich Inches.	Rain at Pisa. l. oz.	Pisa reduc'd l. dec.	Rain at Upm. l. dec.	Rain at Zurich Inches.	Rain at Pisa. l. oz.	Pisa reduc'd l. dec.	Rain at Upm. l. dec.	
1		5 8	5 20						
2	1				2	1 3	3 2	98	
3									
4		7 26	58	0 97	1	1 3			
5	1			0 29		1 0	10 0	76	
6				0 7	2			0 2	
7									
8					2				
9		6 35	74	0 53		2	4 2	14	
10				2 48		1	8 1	53	
11				1 26					
12					2	1 0	9 0	69	
13				1 91					
14		3 43	6 1	88					
15	4			0 4		1 2		0 18	
16				0 92					
17		5 65	4 5						
18		2 22							
19									
20	1	1 2				1 2	1 1	90	0 54
21	1							0 51	
22	4			0 91					
23	2					7 26	58	0 64	
24	2	3 63	21						
25	1	1 2		1 7				0 19	
26				0 80					
27		4 13	75						
28									
29									
30									
31		2 52	22						
Sum	18		33	14 39	18		10 10	2 30	
Dep	1	6 4	5 4	2 8 78	1	6 5	3 28	0 46	

[illegible]

May.					June.	
D of M.	Rain at Zurich Lines.	Rain at Pisa. . oz.	Vila Ra reduc'd. l. dec.	Rain at Upm. l. dec.	Rain at Zurich Lines.	Rain at Upm. l. dec.
1					1	$\frac{1}{2}$
2						0 66
3				1 09	21	$\frac{1}{4}$
4		5 14	66			
5				0 27	2	$\frac{1}{2}$
6		4 43	98			
7		3 103	52	3 28		0 60
8				0 82	1	$\frac{3}{4}$ 0 20
9				0 11		0 90
10						0 11
11						
12	1	$\frac{1}{2}$		0 32		1 66
13		$\frac{1}{2}$			$\frac{1}{2}$	0 15
14		$\frac{1}{2}$				0 76
15	2	$\frac{1}{2}$		1 11	3	$\frac{1}{2}$
16				0 82		
17				0 01		0 02
18				0 96		0 93
19	5	$\frac{1}{2}$				0 04
20	3	$\frac{1}{4}$			19	
21				0 53		2 66
22				0 79	1	
23						1 23
24					6	$\frac{1}{4}$ 0 80
25		3 43	06			0 44
26					1	$\frac{1}{4}$ 0 38
27	2	$\frac{1}{4}$				
28						$\frac{1}{2}$
29	1					
30		2 102	60		6	$\frac{1}{4}$ 0 08
31	4	$\frac{1}{2}$ 1 118	53			
Tot.	21	$\frac{1}{2}$	19 35	10 11	66	$\frac{1}{2}$ 11 61
Dep	1	91	3 33	2 02	5	91 2 32

G g g

July

Day of Mo.	July.			August.			September.		
	Rain at Zurich.		Rain at Upm.	Rain at Zurich.		Rain at Upm.	Rain at Zurich.		Rain at Upm.
	Lines.	l. dec.		Lines.	l. dec.		Lines.	l. dec.	
1	1		0 06						
2									
3	2	$\frac{1}{2}$						0 74	
4			0 03					0 06	
5									
6	25	$\frac{1}{2}$						0 64	
7					3 38	2			
8			0 93			7	$\frac{3}{4}$	0 40	
9			0 49			4	$\frac{1}{4}$		
10			0 59					0 05	
11			0 47		0 07			0 01	
12			0 01					1 41	
13			0 11						
14							5	$\frac{3}{4}$	1 24
15			1 00			2	$\frac{1}{2}$	1 10	
16			0 16						
17					1 05				
18	3			3	$\frac{3}{4}$	0 56	7	$\frac{3}{4}$	0 29
19									
20	2	$\frac{2}{3}$							
21			0 01						
22									
23				27	$\frac{3}{4}$			0 27	
24			0 01		0 15				
25			0 41	1	$\frac{1}{4}$	0 76			
26		$\frac{3}{4}$							
27					0 31	3	$\frac{3}{4}$		
28		$\frac{3}{4}$	1 20						
29				2	$\frac{1}{2}$	1 32		0 99	
30		$\frac{1}{2}$	0 04		$\frac{1}{4}$			0 08	
31	3				7 10				
Tot.	39	$\frac{1}{3}$	5 52	35	$\frac{1}{2}$	14 70	34	7 28	
Exp.	3	50	1 11	3	15	2 94	3	02	1 46

October.

October.			November.			December.		
D. of Mo.	Rain at Zurich.	Rain at Upm.	Rain at Zurich.	Upm.	Rain at Zurich.	Upm.	Rain at Zurich.	Upm.
	Lines.	l. deg.						
1								
2		0 03					0 10	
3							0 07	
4				0 92			0 05	
5		0 08				17 $\frac{1}{2}$	0 27	
6								
7								
8								
9							0 30	
10							0 66	
11	4 $\frac{1}{2}$			2 22				
12		0 06		0 26				
13		0 37				8		
14		0 16						
15								
16								
17								
18		0 31					0 54	
19								
20							1 84	
21	13 $\frac{1}{2}$						1 22	
22								
23		0 02	6 $\frac{3}{4}$				4 00	
24							0 22	
25								
26	6 $\frac{3}{4}$							
27								
28		0 06						
29								
30				0 90		$\frac{1}{2}$		
31	2 $\frac{3}{4}$	0 05				3 $\frac{1}{2}$		
To	27 $\frac{1}{2}$	2 14	7	4 30	29 $\frac{1}{2}$	9 84		
D.	2 44	0 222	0 62	0 86	2 62	1 97		

A Prospect of all the Rain in the foregoing Tables, in every Month, Half Year, and the whole Year, from June 1. N. S. to May 21. O. S. 1707. to the end of the Year 1708.

	Depth of the Pisa Rain.	Depth of the Upm. Rain.	Depth of the Zurich Rain.
	English Inches.	English Inches.	English Inches.
May.	0	12 1	05
June.	0	88 1	34
July.	0	36 1	27
August.	5	76 2	18
September.	6	45 2	90
October.	3	43 1	33
November.	4	22 1	18
<i>The Half Year's Rain.</i>	21	22 1	25
December.	6	39 2	43
Anno 1708.			
January.	6	41 2	88 1 64
February.	3	28 0	46 1 65
March.	2	65 2	03 1 51
April.	1	25 0	96 4 69
May.	3	33 2	02 1 91
<i>The Half Year's Rain.</i>	23	31	10 78
<i>Depth of the whole Year's Rain.</i>	44	53	22 03
June.	4	90 2	32 5 91
<i>The Half Year's Rain.</i>		10 67	17 31
July.		1 11 3	50
August.	2	27 2	94 3 15
September.	7	21 1	46 3 02
October.	5	33 0	23 2 44
November.	0	13 0	86 0 62
December.		1 97 2	62
<i>The Half Year's Rain.</i>	19	84 8	57 15 35
<i>The whole Year's Rain.</i>		19 24	32 66

A Table of the Rain at Pisa in some of the last Six Months of the Year 1708. in Tuscan Pounds and Ounces; and the same reduced to English Pounds Troy-weight, and Centesimal Parts. Observed by Dr. Michael Angelo Tili

June.				July.		August.			
Tuscan Weight.		English Weight.				Tuscan Weight.		English Weight.	
l.	oz.	l.	dec.			l.	oz.	l.	oz.
1									
2	4	13	75						
3	2	21	99						
4									
5	3	43	06						
6	2	82	45						
7									
8	3	32	98						
9									
10	0	90	69						
11									
12									
13									
14	2	1	2	68		10	19	25	
15	0	10	0	76		1	81	53	
16									
17						2	82	45	
18	11	1	10	17					
19									
20									
21									
22									
23									
24									
25									
26									
27									
28									
29									
30									
31									
Total W.		28 53						13 23	
Depth.		4 90						2 27	

H h L

Sep

September.				October.				November.					
D of M.	Luscan Weight.		Engl Weigh		Luscan Weight.		Engl Weight.		Luscan Weight		Engl Weight		
	l.	oz.	l.	dec.	l.	oz.	l.	dec.	l.	oz.	l.	dec.	
1	1	2	1	07	5	14	4	67	3	32		98	
2													
3	10	09		18									
4													
5													
6													
7	12	2	11	17									
8													
9					4	43	98		2	01		84	
10													
11					14	513	13						
12									3	63		21	
13													
14													
15	2	8	2	45	2	32	06						
16													
17													
18					2	62	29						
19					1	91	61						
20													
21	10	49		48									
22													
23													
24	9	48		57									
25													
26					3	73	29						
27													
28													
29													
30													
31													
Total W.				41 92					31 03				
Depth.				7 21					5 33				
										8 03			
										0 13			

II. *An Account of an Experiment, shewing that actual Sound is not to be Transmitted through a Vacuum. By Mr. Fr. Hauksbee, F. R. S.*

THAT the Experiments already made, endeavouring to produce Sound from a Bell *in Vacuo*, have been altogether ineffectual, is sufficiently manifest: Yet that the loss of it should be wholly attributed to the absence of the Air, I think could not without another Experiment be absolutely concluded, since the following Query, (which very well deserves an Answer) might fairly be started upon this Occasion.

Whether the Sonorous Body in such a *Medium* might not so suffer, or undergo such a Change in its Parts, as to be render'd incapable of being put into such a Motion as is requisite for the Action or Production of Sound.

Now to set the Matter of Fact in a true Light as near as I could, I contriv'd the following Experiment.

I took a strong Receiver, arm'd with a Brass-hoop at bottom, in which I included a Bell as large as well it could contain. This Receiver I screw'd strongly down to a Brass-Plate, with a wet Leather between, and was full of common Air, which could no ways makes its escape. Thus secur'd, it was set on the Pump, where it was cover'd with another large Receiver.

ceiver. In this manner, the Air contain'd between the outward and inward Receivers was exhausted.

Now here I was sure, when the Clapper should be made to strike the Bell, there would be actual Sound produc'd in the inward Receiver, the Air in which was of the same density with common Air; and could suffer no Alteration by the *Vacuum* on its outside, so strongly was it secur'd on all sides. And as I said before, that if the Sonorous Body should suffer in any measure, by being in a very rare *Medium*, so as to contribute to the loss of its Sound, that this Method seem'd probable to discover it.

Thus all being ready for Trial, the Clapper was made to strike the Bell; but I found that there was no transmission of it thro' the *Vacuum*, tho' I was sure there was actual Sound produc'd in the Receiver.

This plainly shews, and seems positively to confirm, That Air is the only *Medium* for the Propagation of Sound.

III. *An Account of an Experiment, touching the Propagation of Sound; passing from the Sonorous Body into the common Air, in one Direction only. By Mr. Fr. Hauksbee, F. R.S.*

SINCE by the former Experiment actual Sound could not be transferr'd thro' a Space void of Air; I was inclin'd to try whether that Sound, which should be propagated in a Receiver, having a Communication with the open Air at one small Aperture only, but otherwise intirely surrounded by a *Vacuum*; Whether I say, that Sound would be increas'd, or continu'd Sounding longer, at each Stroke that should be given the Bell, than it would do, were not its Body encompass'd by such a *Medium*. In order thereto, the Bell was included as in the pre-mention'd Experiment; only, to the upper part of its Receiver, was screw'd a Box with Collars of Leather; and on the Top of the outward Receiver, was laid a Brass-Plate with a wet Leather between: In the middle of which Plate, was likewise screw'd another Brass Box with Collars, as before. These Receivers when plac'd on the Pump, had their Boxes standing directly one over the other. Thro' both of them in that Position, I past a hollow Brass Tube, which exactly fitted their Perforations: thus the inward Receiver had a Communication with the outward Air, and the outward Receiver thereby was secur'd from the Ingress of the Circumambient *Medium*. Now when the Air contain'd between the Re-

ceivers was pretty well exhausted, and the Bell struck, the Sound was sensibly very vigorous, and (I think) very nearly as great as before any Air was taken away at all; yet if ones Finger was apply'd to the Apperture of the hollow Brass Tube, the Sound would be so much diminish'd, as but just to be distinguished. By this we see, that since the Sound in that state cannot be transmitted thro' the Receiver that includes it, by means of the surrounding *Vacuum*, yet the Receiver is certainly struck with it; but finding no conveyance that way, reverberates and makes its Passage where it find least resistance. Nor did I observe, that altho' the Sound had but one passage from its Receiver, and that but a small one, that it continu'd any longer from the Stroke, than if it had been made in the open Air.

IV. *An Account of an Experiment touching the Propagation of Sound through Water.* By Mr. Fr. Hauksbee, F. R. S.

AN Experiment that I made some time since, shewing that actual Sound could not be transmitted through a Vacuum, gave me an Inclination to try what would be the effect, to surround the Receiver that contain'd the sounding Body, with so dense a Medium as Water. Accordingly, as in the former Experiment, the Receiver which contain'd the Bell was screw'd down to a Brass-plate, with a Leather between; This Receiver with its Bell, was suspended in a large Glass-Vessel, by Four Twine-threads to the top, and as many to the bottom: whereby it remain'd in the middle between both. Concluding likewise, that these Threads would so absorbe the Water when it should come to be put in, that there could be no Apprehension, that any Sound shou'd be convey'd by them from the sounding Body, any more than if they were intirely Water. Thus provided, the Clapper was made to strike the Bell, whose Sound was something less by the Interposition of the Glass, than it would be, had it been made in the open Air; however it was very audible, and might be heard at a considerable distance: It appear'd to the Ear to be very harsh, in respect to the Tone it afforded us. But now, when the Water came to be pour'd in, and the inward Receiver surrounded by it, at least an Inch and an half from the nearest part of the outward Glass, the Clapper again was made to give the Sound; which it did, seemingly, very little less,

in

in respect to its Audibility; but much more mellow, sweet, and grave at least two or three Notes deeper than it was before; as was observed by some of the Society then present.

V. *An Explanation of the Figures of a Pagan Temple and unknown Characters at Cannara in Salset. By Mr. Alexander Stuart.*

Fig. I. **T**HE rocky Mountain *Cannara* in the Island of *Salset*, belonging to the *Portuguese*, with the Temple and Caverns.

A. The Temple and Sacrificing-place, like the Choir of a Church, arched and supported by 45 Pillars, all cut out of the Rock.

B. The Altar in the furthest end of it, also cut out of the Rock; with a narrow Canal about the foot of it, I suppose, designed to be filled with Water.

C. C. The unknown Characters engraven on the Rock, on each side of the square Entry; represented in *Fig. 2.*

D. D. D. &c. The various irregular Paths of Ascent, some cut out in Steps as Stairs.

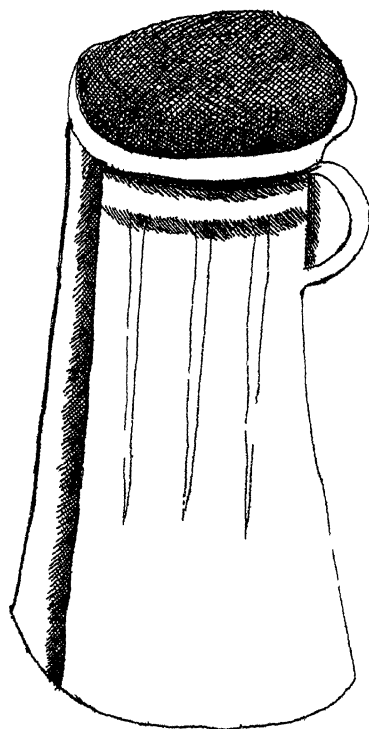
1, 2, 3. &c. The various Caverns, mostly of a square figure; some large, others smaller; cut out of the Rock; whose Roofs are cut plain, like a plaster'd Room: At the Door of each without, is a large Cistern or two, cut out of the Rock, full of Rain water; at least, I could not perceive them to be Springs.

Upon the sides of the Doors of some of the Caverns, are Characters like those of the Temple.

Fig. II. Characters engraven on each side of the Door or Entry of the Pagan Temple of *Cannara*. See *Philos. Transact. Numb. 201. where some of these Characters are engraven.*

L O N D O N: Printed for H. Clements, at the Half-Moon in St. Paul's Church-yard. 1709.

Philos: Trans^s N^o 322.



PHILOSOPHICAL TRANSACTIONS.

For the Months of July and August, 1709.

The CONTENTS.

- I. **E**xperiments upon Metals, made with the Burning-glass of the Duke of Orleans. By Monsieur Geoffroy, F. R. S.
- II. Observations upon Incisions of the Cornea. By Monsieur Gandolphe, Doctor of Physick at Dunkirk. April, 1709.
- III. An Account of an Experiment, shewing that an Object may become visible through such an Opake Body as Pitch in the Dark, while it is under the Circumstances of Attrition and a Vacuum. By Mr. Fr. Hauksbee, F. R. S.
- IV. A Letter from Mr. Ralph Thoresby, F. R. S. to Dr. Hans Sloane, R. S. Sec. concerning some Ancient Brass Instruments found in Yorkshire.
- V. A Letter from Mr. Tho. Hearne, M. A. of Oxford, to Mr Ralph Thoresby, F. R. S. occasioned by some Antiquities lately discover'd near Bramham-Moor in Yorkshire.

I. Experiments upon Metals, made with the Burning-Glass of the Duke of Orleans. By Monsieur Geoffroy, F. R. S.

THE Duke of *Orleans*, out of the desire he has to promote useful Arts and Sciences, having permitted such of the Royal Academy of Sciences as have had most Experience in subjects of this Nature, to make use of his Burning glass; I took this Opportunity to examine the different Changes that Metals suffer when placed in the Focus of this Glass, whose Heat and Efficacy far exceeds the force of our common Fires.

The Burning glass is three Foot in Diameter; it collects the Rays of the Sun at ten Foot distance, where it forms a Focus of about three Inches over, which is again contracted by means of an other Glass-Lens to an Inch Diameter, and consequently is render'd three times as strong.

I shall only relate here what I have observ'd upon the four Imperfect Metals, *viz.* Iron, Copper, Tin, and Lead: And shall say nothing at present of Gold or Silver; because as their Analysis seems to me much more difficult than that of the other Metals; I shall forbear Inquiries upon them, 'till I have examined as far as possible into the Nature and Composition of the former.

What was a great hindrance to me in making these Experiments in the Focus of the Glass, was the difficulty I had to find any Matter capable of holding the Metals in fusion.

Charcoal, which is commonly made use of, is indeed a very proper substance ; but it is impossible with it to vitrify any one of the Metals : The Particles of the Metal, when held any long time in fusion in the Focus of the Glass, dissipate and fly away in Fume or small Particles ; and as long as any part remains, that little that does remain, is always Metallick, until the whole be quite evaporated.

The reason of which I take to be this. Charcoal is a substance deeply impregnated with Oily or Sulphurous Parts (if I may so call them.) The first Effect that Fire has upon Metals is to separate the sulphurous Parts : now, if in proportion as the Sulphur is separated from the Metal, the Body that supports the Metal furnishes it anew with other sulphurous Parts, the other Principles will never separate, and the Metal will always remain Metal. And nothing but the greatest degree of Fire is able to raise and separate the Sulphur, and that but by little and little, and in very small Particles.

I had then recourse to an other Matter, that could not any ways be suspected of containing any Oily Parts. Mr. *Tschirnhaus*, to whom we are obliged for Making of these large Glasses, and the first Experiments that have been made with them, says, he has vitrified Metals by holding them in *China* ware. It is true, this succeeds pretty well, provided the Pieces be very thick, and the Glazing taken off : But the difficulty I had to find a sufficient quantity of thick and proper *China* ware to make all these Experiments, forced me to have recourse to more common subjects, as well as such, if possible, as were less capable of melting.

Of all the different sorts of Matter that I made Tryal of, what seem best were the Common Coppels and Plates of gray Fire-stone. The Coppels hold the Metal a long time in fusion in the Focus of the Glass without melting; excepting Lead, which easily runs thro' them as soon as
it

it vitrifies, and helps to dissolve them. The Plates of Fire-stone bear the Heat of the Focus much longer than any other Matter ; but great care is to be taken in heating them without breaking, 'till they become red-hot, and when they are hot the least cold Air makes them melt. Nevertheless this is the only substance that I have used with most success, to hold Metals a long time in fusion, tho' with the greatest caution that was possible, to avoid the Inconveniences aforementioned.

An other thing that has hinder'd me from carrying on these Inquiries upon Metals so far as I could have wished, has been the few clear Days we have had for these two Years past ; for the greatest part of these Experiments require a bright, strong, and constant Sun to keep the Matter a long time in perfect fusion : And I have scarce had, for this last Year, above three or four such days as I could wish for ; the Sky having been almost every day cover'd with Clouds about Noon, which is the only time of the day fit for these Experiments.

I come now to the Particulars of what Experiments I have made ; and shall begin with those on Iron.

Of Iron.

I placed in the Focus of the Burning-glass a piece of forged Iron of about a Drahm weight: It turn'd red-hot, and its surface was cover'd with a black Matter like Pitch or Tar. If one withdraws the Iron out of the Focus in this state, this Matter fixes itself on the surface of the Metal, and there forms a small Skin or very fine blackish Scale, which is commonly very easily separated by striking upon it ; and that part of the Iron that was cover'd with this Scale appears blacker than ordinary. This Scale is some of the sulphurous part of the Iron that rises to and Surface of the Metal when it is ready to melt, the there remains for some time before it exhales.

It

It is plainly this sulphurous part that rises upon Iron and polish'd Steel when heated, and gives them all those different Colours, from a Yellow, to a Violet, Water-Colour, or Black.

If one continues to hold this Piece of Iron on the Charcoal, it intirely melts; and at the same time casts forth very bright Sparkes in a great quantity, sometimes to above a foot distance from the Coal.

If one saves what flies off during this sparkling, by holding a Sheet of Paper under the Coal; we find that they are so many very small Globules of Iron, and the greatest part of them hollow.

All the Iron that is held in fusion upon the Coal, flies away in sparkles after this manner, 'till none remains. Sometimes the Metal leaves off sparkling, when the Coal is in part consumed, and cover'd with a Bed of Cinders, upon which lies the melted Iron. For as the sparkling of the Iron seems to me to proceed from nothing but the oily parts of the Coal acting upon those of the Metal, the Cinders hinder this Oil from passing from the Coal to the Iron, so that it remains quietly in fusion. But if thro' any shake, or the like accident, the Cinders are so removed that the Iron comes to touch immediately the Coal, it will begin to sparkle afresh. Sometimes the Heat that keeps in fusion the Metal, vitrifies also the Cinders; and this vitrified Matter mixing with the Metal makes a considerable Ebullition. If one at this instant withdraws the Metal out of the Focus, it appears half vitrified, or reduced to a blackish friable Mats. Othertimes this vitrified Matter swims on the surface of the Metal, and there forms it self into Drops, that are sometimes clear and transparent, and other times opake, according as it is more or less mixed with the Metal.

Furthermore, if after having let the melted Iron cool upon the Coal, one exposes it again to the *Focus* of the Glass upon the Stone, it sparkles afresh till it is all consumed; which common Iron will not do, that has not been exposed to the heat of the *Focus* upon Charcoal. This Sparkling probably proceeds from the sudden Rarification of the Oily parts of the Coal, with which the Pores of the Iron are so plentifully saturated; or perhaps it may be caused by the Salts of the Iron acting on the Oil of the Coal.

I exposed to the *Focus*, upon a Stone-slate, Iron and Steel: they grew red hot, and melted without crackling or casting off any Sparkes: they smok'd very considerably, and the melted Metal turn'd by little and little like an Oil. After having withdrawn this melted Matter out of the *Focus* it fix'd in a Regulus-like, friable Mass, and appear'd sometimes lightly striated, or shot into sharp Points like Needles. Tho' this matter does not appear at all transparent, yet we may look on it as the beginning of Vitrification, or a middle state between Metal and Glass; for it would vitrify in the end like other Metals, if one could hold it a sufficient time in the *Focus* without melting or mixing with what sustains it: But continuing it long in the *Focus*, the extrem Heat of the Sun, that is necessary to keep it in perfect fusion, melts likewise the Stone or Coppel that contains it, the result of which mixture is a brown or greyish sort of Enamel.

We may then take this Regulus Mass to be a half vitrified Iron, by reason it is deprived of great part of its Sulphur. If one adds to this Mass a Sulphur like that which was taken from it, from being friable it turns very hard and malleable; and the dulness it had before, changes to the brightness of a Metal. This is what I have experienc'd in exposing again this Matter to the *Focus* upon Charcoal: it melts, and so continues a considerable time
in

in fusion without sparkling, but at last it sparkles with the same briskness as Iron itself; and when withdrawn from the Focus, appears nothing different from melted Iron.

It appears from these Experiments, that Iron contains a Sulphur or oily Substance, that renders it bright, malleable, and easy to melt.

That this Sulphur is raised by the Fire of the Sun, when the Metal is for some time held in fusion in the Focus of the Glass.

That this same Sulphur may be raised by the Flame of common Fire, which tho' not strong enough to melt the Iron, yet is able to reduce it to an Eschar or sort of Rust.

That Iron deprived of this sulphurous part, melts into a Regulus, or brittle and friable Mass, in colour much like Antimony.

That if one can hold a sufficient quantity of this Matter long enough in the Focus by itself, without melting or mixing with the Body that contains it, it perfectly vitrifies.

That this Glass or metallick Regulus, with the help of a little Oil, returns to its former state of a Metal.

That it reassumes this metallick Form upon Charcoal, by drawing thence this oily Substance.

That, in short, this oily part contain'd in the Coal, is little different from the Sulphur of Iron. Nevertheless we must imagine it to differ in some particulars, in that melted Iron that has been saturated with it, crackles and sparkles very much when melted again upon the Stone or Coppel.

Iron being the only Metal in which I have observed this sparkling, I take it to be a Property peculiar only to Iron and not to any other Metal. Perhaps we may attribute it to the vitriolick Salt that this Metal so plentifully abounds with, which is very greedy of Sulphurs.

To this same greediness also, with which the vitriolick Salt of Iron absorbs the oily part of the Coal, we may attribute the easiness with which Iron consumes the Coal; for there is no other Metal that so soon waists the Coal in the Focus of the Glass, as Iron does.

Another Observation upon Iron is, that it is the only one of the four imperfect Metals, on which vitrified Drops arise while it is in fusion upon the Coal: The reason of which I have not yet been able to discover.

Of Copper.

Copper exposed to the Focus of the Burning-glass, at first turns white on its surface, and afterwards grows black, and is covered with a kind of Skin, or black, furrow'd, and uneven Scales, till at last it quite melts.

I have withdrawn this Metal out of the Focus as soon as this white colour has appear'd, and after it has been cold, found nothing extraordinary on its surface, which has again by little and little recover'd very near the same Colour as it had before.

I have not been able to discover from whence this white Colour proceeds; unless we may attribute it to some Volatile Arsenical Salt contain'd in the Copper, and driven by extremity of Heat to the surface of the Metal; or whether it purely proceeds from the alteration that is made in the grosser parts of the surface of the Metal when it begins to melt. The black colour that Copper afterwards takes, seems to be caused by the sulphurous Matter that melts first in this Metal as well as Iron, and is rais'd to its surface by the extream Heat.

I placed a piece of Copper in the Focus upon Charcoal: It melted, and emitted a very thin Fume, and by little and little diminished till it was all evaporated.

I put a piece of red Copper on a Coppel into the Focus of the Glass: it melted, and sent forth some thin Fumes; and after it had been some time in fusion, it turn'd liquid like an Oil. I withdrew this melted matter, and as it grew cold, it fix'd into a Regulus of a reddish brown colour, which was hard, brittle, and not ductile under the Hammer. If one breaks it, it turns into a red Powder like Cinabar of Antimony; and when view'd with a Microscope, appears so many little, red, transparent Grains like small Rubies; in so much that one would readily take this Regulus to be a deep colour'd red Glass.

I endeavour'd to make this vitrified Copper spread abroad in melting, by mixing it with common white Glass; for which end I powder'd some of this vitrified Copper and common Glass, and mixing them melted them together; but the Mixture when in fusion took at first a beautiful green Colour, and continuing it longer in the Focus, it turn'd blewish. I believe we may attribute this change of Colour to the Alkali Salts of the Glass acting on the Particles of Copper; for those Salts usually draw a green or blewish Tincture from this Metal.

To preserve therefore this red Colour of the vitrified Copper, when mix'd with common Glass, I made use of this Expedient. I melted in the Focus upon a Coppel a piece of Copper, and as soon as it began to vitrify I cast upon it some common Glass; as soon as the Glass was melted I took them together out of the Focus without confusing them; and as soon as they were cold, separated the Regulus from the Glass as well as possible; and pick'd out of it some pieces of the Glass, loaded with some very small red transparent Particles of the Regulus.

This

This vitrified Copper is then nothing but Copper deprived, by means of heat, of the sulphurous part, that gave it the form of a Metal. A proof that this metallick form proceeds from nothing else but this Sulphur, is, that if one exposes this vitrified Copper to the Focus upon Charcoal, it reassumes in a little time the Colour and Consistence of melted Copper; and as it grows cold, fixes into a good red malleable Copper, as fine and hard as it was before it was vitrified.

It follows from these Experiments, that the Basis of Copper is a red Earth susceptible of Vitrification.

That this Earth receives its metallick Form from a sulphurous Substance, in appearance no ways different from the Oil of Vegetables or Animals.

That one may deprive Copper of this Oil, by holding it long enough in the Focus, or by calcining it in the Flame of common Fire.

That Charcoal restores again this oily Part to Copper, and at the same time its metallick Form.

It appears further, that the Oil of the Coal has not so considerable an effect upon Copper, as it has upon Iron.

Copper exposed a long time to the Focus upon a Stone or Coppel, fumes very much, and diminishes in weight very considerably. I don't think that this fume is only the sulphurous part of the Metal, the Evaporation of which must be insensible; but I believe that with this Oil there is mixed a great deal of the earthy, vitrifiable part of the Metal, which the heat of the Sun sublimates and raises in Flowers.

Of Tin.

Tin exposed upon Coal to the Focus of the Burning-glass, melts, and emits a gross, white, thick Fume, until it is all consumed in Vapours.

If one melts Tin upon a Coppel in the Focus of the Glass, it fumes very much, and its surface is cover'd with a white rarified Calx; on which by little and little arises a tuft, or heap of sharp, needle-like, transparent, crystalline Particles, consisting of an infinite number of small Points.

If one continues to hold this Mass in the Focus upon the Stone, these Crystals at length leave off fuming, and remain fixt, while the Stone melts and vitrifies.

I took Calx of Tin, which is Tin reduced to a grey Powder by means of Fire, that has taken away by Calcination great part of its oily Substance, and exposed it on a Coppel to the Focus, where it turned again very much, and was reduced into sharp crystalline Particles consisting of other small Points.

In re-exposing these chrystalline Particles to the Focus upon Charcoal, they melted very easily, and took again the Form of Tin; the Coal having furnished them with the sulphurous part that the Fire had before taken away. Every body knows, that if one adds any Fat, or the like inflammable Matter, to the Calx of Tin when red hot in the Crucible, it reassumes immediately the form of Tin.

These Experiments show, that Tin contains a Sulphur that is very easily separated, since common Fire can do it so readily; and that this Metal calcined, or deprived of its Sulphur, is easily saturated again with it from the oily part of any inflammable Matter whatsoever.

It proves also, that the metallick Earth which is the Basis of Tin, is a Crystalline Earth, very difficult to be melted; since common Fire cannot vitrify this Metal by it self, and that the heat of the Sun, in the Focus of this large Burning-Glass of the Palace-Royal, cannot perfectly melt the Calx into which this Metal is reduced. We may presume that the Crystallisation, or reducing of this Metal into sharp-pointed Particles, proceeds from the force

the Sun's breaking and melting together into a Sodder (if I may so speak) some of these small Crystals, by degrees as the sulphurous part leaves them; it not being strong enough to melt them all down together in one intire Mass.

Of Lead.

I took Lead, and held it in fusion upon Charcoal in the Focus of the Glas: it all wasted away in abundance of Fumes.

I exposed the like quantity of Lead upon a Stone to the Focus, where it cast forth great quantities of fumes, and by little and little changed into a fluid Liquor like Oil or melted Rosin. This Liquor, as it grew cold, fix'd into Glas; which has this peculiar to it self, that it is disposed into Plates like *Venetian Talk*, and that it is flabby, soft to the touch, transparent, and in some parts of a greenish or reddish Yellow.

In continuing this matter in the Focus, it spread upon the Stone like Varnish; and at last penetrating it, help'd to melt it.

I placed this talky Earth in the Focus upon Charcoal: It melted, and in a little time after reassumed the form of melted Lead. I withdrew it from the Focus, and having let it cool, found it nothing different from Lead.

These Experiments show, that there is in Lead, as well as the other imperfect Metals, a sulphurous part, that is easily separated by common Fire or the heat of the Sun; and that this Metal has for its Basis a foliated or talky Earth

Of Quicksilver.

I shall add here some Experiments that I have made upon Quicksilver; tho' I can't yet draw any positive Conclusions from them, not having prosecuted them so far as is necessary for that purpose.

I placed Quicksilver in the Focus of the Burning-glass upon Charcoal, upon the Coppel, and upon the Stone: It all immediately dispersed, and exhaled in a very thick Fume.

I exposed upon the Stone to the Focus some *Mercury precipitate per se*, in a degree of heat equal to that of digestion: It seem'd to melt, but presently dispersed in Vapours: only there remained a small quantity of a very rarified Dust, like a Froath or Scum; but continuing it in the Focus, it melted, and gathered into a yellowish Glass, in which one might distinguish some Particles of Metal like Silver.

I exposed some *Mercury Precipitate per se* upon Charcoal: It fumed very much; and as it melted one might see little Globules of Mercury unite and form themselves together upon the Coal, but they dispersed again presently in Vapours.

These Experiments seem to prove, that there is in Quicksilver a Sulphur that may be separated by a very gentle heat, such as that of Digestion.

That as soon as this Sulphur is taken away, it loses its Fluidity and Brightness.

That the Basis of Mercury is a Calx, or red Earth.

That this Calx does not melt into Glass as the Calx of other Metals, because it is too Volatile, and as soon as it melts is evaporated by the heat.

That if one restores to this Calx a Sulphur, by exposing it again to the Focus upon Charcoal, it reassumes immediately its metallick Brightness and Fluidity, and becomes Quicksilver.

I cannot tell whether this light Earth, that remains upon the Stone after the evaporation of the Calx of the Mercury, be a part of the Earth of the Mercury more exactly deprived of its Oil, and consequently more fixt and proper for Vitrification; or whether it may not be some Matter foreign to the Mercury, that fixes it self, and remains behind at its Evaporation. But this I shall examine more particularly hereafter.

The Result of all these Experiments is, that these four Metals which we call imperfect, *viz.* Iron, Copper, Tin, and Lead, are composed of a sulphur or oily Substance, and of a metallick Earth capable of Vitrification.

That from this Sulphur proceeds the Opacity, Brightness, and Malleability of a Metal.

That this metallick Sulphur does not appear at all different from the Oil of Vegetables or Animals.

That it is the same in Mercury as in the four imperfect Metals.

That these four Metals have for their Basis an Earth susceptible of Vitrification.

That this Earth is different in every one of these four Metals; in that it vitrifies differently in each of them.

And that on this difference in Vitrifying depends the difference of Metals.

It remains that I should examine more particularly the Nature of these Earths or metallick Vitifications; to know if any other Principles or Substances may be separated from them: But this I shall endeavour to do hereafter, in prosecuting the Analysis of these Metals as far as possible.

II. *Observations upon Incisions of the Cornea. By Monsieur Gandolphe, Doctor of Physick at Dunkirk. April 1709.*

Contusions upon the Bodies of Animals do not always make the greatest Impression on the Parts that immediately receive them: I had an Instance of this, in a blow upon the Eye, this present Month of April, 1709.

There was a light Contusion on the outside of the Part, with very little alteration to appearance; but a Vessel being broken within, pour'd forth a considerable quantity of Blood: The Eye also lost its Transparency, and almost its Sight; which was so very weak, that it could scarce perceive the greatest Light when objected to it. The *Cornea* appear'd all over red, but without any Inflammation or Blood-Vessels; it receiving its colour from the Blood pour'd in upon the *Aqueous Humour*.

I saw the Patient the 6th day after he had received the Hurt: He had been let Blood thrice; and the 8th day I caus'd the *Cornea* to be open'd near the middle; my design being to make a large Orifice, I determin'd not to make it at the bottom of the *Cornea*. The Orifice being made, there came forth some drops of the *Aqueous Humour* mixt with Blood. The *Cornea* still appear'd as red as before, and was not so even as we could have wish'd. This Circumstance made me resolve to make a second Orifice immediately, as large as the former, but lower: There run out some drops of the *Humour*; and the Eye appear'd not so red and convex as before. The

Humour continued coming out of the Orifice for some time. We applied nothing to the Eye, but a Compress (or Stupe) dipt in a Mixture of four Ounces of Plantain-water, and two Ounces of a Vulnerary Water.

The day after the Operation, the upper part of the *Cornea* was transparent, the lower part not so red, and the whole Membrane appear'd to have recover'd its natural Convexity. It seems that all the extravasated Blood had quite run out, had the lower part of the *Cornea* been open'd, and remain'd so for some time.

I observed the Alterations of the Eye for three days together; in which time the extravasated Blood seem'd some times to spread over the whole Cavity of the *Cornea*.

We judg'd that the motion, that the Patient himself, had opened anew some Blood-veffel, or had mix'd the extravasated Blood with the *Aqueous Humour*; for we did not perceive all that time that there was any fresh Effusion of more Blood.

The 5th day after the two first Incisions I caused a third to be made at the bottom of the *Cornea*: there run out some drops of the *Humour*, and continued so to do for some time; and in two days after, the Eye recover'd its natural Transparency.

The *Pupil* was now very much dilated; but by little and little it contracted again, but not to its usual smallness.

The *Iris* all this while kept its motion; so that we cannot suspect that the Lancette, in making the Incision on the *Cornea*, any ways touch'd upon the *Iris*, because the *Pupil* continued exactly round: And a stroke, that is able to divide the continuity of the Parts of the Eye, and cause a suffusion of Blood, is but too capable of depriving the *Iris* of its natural Power of Contracting.

The *Pupil*, which before the Blow was one Line in Diameter when the *Iris* was contracted, is at least two Lines in Diameter at present. The transparency of the *Humours*, and Convexity of the *Cornea* are the same as before.

The Sight is now restored ; and there remains no other alteration than what necessarily follows from the like Dilatation of the *Pupil*.

From hence we may draw some Remarks, that will be of use in Practice, and shew that Incisions may be successfully made on the *Cornea*.

1. Incisions are made on this Part without any Pain.
2. The Orifices unite again without any Scar, which has been before observed, but is known to very few.
3. We find that Plants of a discurssive Quality have an ill effect, the Patient finding himself much worse after using a Cataplasme made of Cervile and Parsley : These Plants, which are excellent in resolving Extravasated Blood in the Muscular Parts, have an ill effect when applied the to Eye, by causing Pain, and rendring the Sight more disturbed. We had twice experience of this ; and the Patient assured us both times, that he found himself much better from the use of the first Medicine.

When there is a considerable Effusion of Blood in the Eye in couching of a Cataract, and no Orifice is made in the *Cornea* to let it out, it may so alter the Transparency of the *Vitreous Humour*, as to cause a loss of Sight ; which sometimes follows from this Operation.

Additions.

I made the Incision higher on the *Cornea*, than it ought to be, because the Person that perform'd the Operation, having never before made the like, and desiring to make an Orifice large enough to discharge easily the *Aqueous Humour*, I thought it proper to make it near the
middle.

middle of the *Cornea*, that the Point of the Lancette might not touch upon the *Iris* ; which would have been of much worse consequence than a Scar. The Effusion of Blood, that sometimes happens in Couching of Cataracts, is discussed again either by external Applications or the Help of Nature ; but when the Effusion is very considerable, this Operation may be necessary to prevent worse Consequences.

As for the Scar, that sometimes follows from an Incision of the *Cornea*, I remember I have read in an ancient Physical Author, that we need not fear it : But if we Practice Incisions on Eyes affected with Inflammations, Ulcers, or Defluxions, which very much dilate the *Retina* and Vessels, an Eschar forms itself much more easily in these Cases, and consequently we ought to use the greater caution ; which was not so necessary in my Patient, who had no kind of Inflammation on the Eye or *Cornea*.

III. *An Account of an Experiment, shewing that an Object may become visible through such an Opake Body as Pitch in the Dark, while it is under the Ctrcumstances of Attrition and a Vacuum. By Mr. Fr. Hauksbee, F. R. S.*

THIS Experiment affords a signal Confirmation of another formerly made, and differs only in the Matter made use of. I before used Sealing-wax, but now made choice of Pitch, which I serv'd as the Sealing-wax; that is, I melted it in a Globe-glass, and kept it turning about 'till the larger half had got a pretty thick lining of it; it was even so thick that a Ray of Light could no way penetrate it. This Globe I exhausted of its contained Air; then (being Night) I put it on the Engine to give motion to it; where, after it had been turn'd a little while, with my Hand on that half lined with the Pitch, I could very easily discover thro' the transparent part, on the inward surface of the Pitch, the very shape and lines of it, as likewise of my Fingers; for the most eminent Parts of the Hand and Fingers that toucht the Glass, appeared all luminous: The other Parts discovered themselves by the dark Intervals they made between the enlighten'd Parts: And when the Fingers were spread or clos'd, 'twas very obvious to the Sight. Now, after a small quantity of Air was let in, the Light disappear'd on the inside of the lined part (but not on the other,) which began to discover it self more and more on the outside; tho' even in Vacuo there was always a Light attended on the touch of those Parts that were most contiguous to the

the Glass: But now a Circle of Light would discover it self just on the edge of the Pitch which seperated it from the transparent Part, as likewise another ring of Light somewhat nearer to the Axis of the Glass, but both these when the Hand was apply'd to the under part; for when it was remov'd to the contrary, no such appearance ensu'd. The transparent half of the Glass was in all Circumstances as in former Experiments. When all the Air was let in, the Electricity of the Glass in all its parts, the Lin'd as well as the Transparent, performed much alike. The Threds seem'd to be attracted every where with equal Vigour. To conclude; this, and the foremention'd Experiment of the Sealing-wax, plainly discover, a transparent Quality in some Bodies (we call Opaque) under such and such Circumstances: Bodies which are really Opaque, have hitherto been thought to continue always so. It was never so much as suspected, that they could exchange that Quality for the contrary one, and then come back from that contrary one to their old State again: That they should pass from Opaque to Pellucid, and from Pellucid to Opaque; at one time admit, and at another time oppose the passage of Light: And all this by a meer change of external Circumstances. This Property I say is as new as 'tis real and surprizing; and the bare consideration of so very unlikely and unexpected a thing, may be a ground of encouragement to hope, that some other odd Properties of Bodies, by some lucky Trials, may hereafter (as this has done) surprize us with a discovery of themselves. I shall only add, that what is said towards a Reason of such an Appearance in the Experiment of the Sealing-wax, I think is very applicable to this; to which I refer. See *Physico-mechanical Experiments on various Subjects*, Pag. 131.

IV. *A Letter from Mr. Ralph Thoresby, F. R. S.
to Dr. Hans Sloane, R. S. Sec. concerning some
Ancient Brass Instruments found in Yorkshire.*

Honoured S I R,

WEAPONS of Brass having been discontinued for many Ages, it may not perhaps be unacceptable to you to have an Account of some that were lately found in these Parts; for what use they were originally designed I dare not determine, so shall only relate Matter of Fact as to the discovery of them, and give you their form, desiring your Sentiments of them, and such ingenious Gentlemen as you may please to communicate this unto.

As the Servants of Mr. Ellis of Kiddal (Father to the present Sheriff of the County) were Plowing in a Place called *Osmond-thick*, near the noted *Bramham-Moor*, they discovered five or six Brass Instruments, which are of different sizes, from little more than 3 to 4 Inches and an half in length, and from 1 and a half to 2 Inches and an half in breadth: They are somewhat in the form of a Wedge, as proceeding from a thin Edge, which after so many Ages is tollerably sharp, to 1 and an half or 2 Inches at the thicker end, where they are wrought hollow to put upon a Shaft: Each of them has an Ear or Loop, which that you may the better perceive the form of, I have added the Figure of one (in its exact size) that was sent to this Repository. Some suppose them to have been *Arrows-heads*, or *Axes* of the ancient Britains; others, those of the *Roman Catapultæ*; but I think they are as much to heavy for the first, as they are

*See the Plate
at the begin-
ning.*

too light for the last. I should rather take them to have been the *Heads of Spears*, or *Walking-staves* of the civilized *Britains*; and tho' of a somewhat different Form from those described by *Speed* (*Hist. of Great Brit. cap. 6.*) in their *Portraits*, taken I presume from ancient Manuscripts, yet by the Loop in the side we may better conceive how those ornamental Labels were fastened, than by the Pictures there exemplified.

That *Swords* or *Daggers* were used of the same Metal in old time, as well in *Ireland* as *Great Britain*, (of which there are several described in the last Edition of the *Britannia*) I conjecture from some that were found there of late Years, one of which was brought me by a Friend from thence: It proves of a middle size, *viz.* eighteen Inches long in the Blade; whereas of those found in *Wales*, some were but Twelve, others Twenty four. The Hilt or Handle probably was of Wood, (as is that of an old Sword that I have now by me, which is five Foot and a half long) for that it is wholly consumed: They have been fastened together by four larger or two less Nails, as appears by the Holes in the Brass which are yet entire. And now that I am upon this subject, I have an ancient Spur, that is no less than six Inches and an half long, from the Heel to the middle of the Rowel; but this, which is gilded, and of nicer Workmanship, I suppose to be of a much later date.

I am, &c.

Ralph Thoresby.

V. *A Letter from Mr. Tho. Hearne, M. A. of Oxford, to Mr. Ralph Thoresby, F. R. S. occasion'd by some Antiquities lately discover'd near BRAMHAM-MOOR in YORKSHIRE.*

WORTHY SIR,

§. 1. **F**ROM the great Variety of *antient Monuments* continually found in these *Islands* 'tis plain that vast *Improvements* might be made to the *Accounts* that have been hitherto given of the *British Antiquities*, and there is no reason to doubt but if Mr. *Cambden* were now living he could with ease enlarge his *Britannia* to another Volume of *equal Value* with the former. *Coyns* were not so generally taken notice of by *learned Men* at that time as they have been *since*; at least if they did take notice of them, yet they were not so *curious* as to put down the several *Descriptions* of them, nor to consider their *true Use*. Since his *Excellency* Baron *Spanheim's* Book, and other *Works* of the same kind were publish'd, *Scholars* have been more *inquisitive* after these *Relicks*; and from the *infinite* numbers dug up amongst us, divers *Places* that were of *note* in the times of the *Romans*, but are now quite destroy'd, have been found out, which Mr. *Cambden* knew nothing of in his time for want of these *Discoveries*. Add to this that the *Antiquity* of some other *Towns* may be carried by these *Helps* much higher than he has done in his *respective* Discourses of them; and particularly *Witney*, within seven Miles of *Oxford*, appears to be of

note long before *Edward the Confessor's* time, as I gather from *Roman Coins* lately found there, some of which I have had communicated to me by the Reverend Dr. *Ralph Trumbull*, not long since *Rector* of that Place. The best of those sent to me is one of *impure Silver* (according to the *Custom* of that Time) in Honour of *Julia Mamaea*, Mother to *Alexander Severus*. That which makes it the more likely that here was a *Town* so early is this, that the *Ickenild Way* passed not far from it on the right hand in it's Course to *Girencester*, where all the four *Great Ways* cross'd. I might here mention other Places, that have receiv'd the same *Advantage* for their *Antiquity*, if I were not sufficiently satisfied that you are much better acquainted with this Part of *Learning*, and with the *several Uses* of it than I am. Thro' the *Ignorance* of divers that light upon these *old Monuments* it is that many of them are quite destroy'd ; but then there are not wanting several *ingenious Gentlemen*, who out of a natural Love to *Antiquity* spare no *Costs* nor *Pains* to collect and preserve as many as they can, and are always ready to communicate to the *Publick* their *Observations* upon them. Amongst these I deservedly reckon your self, who as You have made a very good *Collection*, so you have withal been pleased to oblige the *Learned World* with several curious *Discourses* upon them in the *Philosophical Transactions*. You have likewise been so kind as to favour me with the Account of some of them, and when I was engaged in the *Oxford Edition* of *Livy*, you took care to transmit to me two *Inscriptions*, which shew that the *ixth Legion* of the *Romans* resided at *York*. These I have made publick at the End of the last Volume in the *Annotations* (a). But I am most concern'd at present for the *old Instruments* which you tell me were some Months

(a) See Vol. VI. pag. 181.

since found at a Place call'd *Osmondthick* near *Bramham-Moor* in your County, concerning which you desire I would give you my Opinion ; which I shall the rather do that you may see I am not unmindful of your Favours, but am willing to make all possible Returns I can.

§. 2. These *Instruments* it appears from your *Letter* are of *Brass*, and are *five* or *six* in number, but of different *Sizes*, from a little more than three to four *Inches* and a half in *length*, and from one and a half to two and a half in *breadth*. They are somewhat in form of a *Wedge*, as proceeding from a *thin Edge* to one and a half or two *Inches* at the *thicker End*, where they are *hollowed* to put upon a *Shaft*. Each of them has an *Ear* or *Loop*, which that I may the better perceive the *form* of, you have been at the *Pains* of adding the *Draught* of one, accurately done by your self. From your *exact* and *nice* Relation 'tis plain that they are just like that we have in the *Repository* adjoining to the *Bodlejan Library* at *Oxford*. This has been kept there for several *Years*; but where 'twas discovered there is not the least *Memorial* to inform us. Perhaps it might be procur'd by *Dr. Plot* when he was writing the *Natural History* of *Staffordshire*, where he has (b) mentioned several *Instruments* of the same kind dug up in that *County*. You have told me that 'tis your Opinion that these *Instruments* were the *Heads* of *Spears* or *walking Staves* of the *civiliz'd Britains*; and for Confirmation of it you refer me to *Mr. Speed's History* of *Great Britain*, (c) where he has publish'd the *Figures* of the *antient Britains* both before and after they were *civiliz'd*. You acknowledge however that the *Tops* of the *Spears* there are *somewhat different* from those we are now considering. And indeed they are not only *somewhat* but *altogether* diffe-

(b) See Chap. X. §. 19. &c. (c) L. 1. c. 7.

rent, being exactly of the same *Make* with those we find in the *Columna Trajana* and the *Books* that represent to us the *Military Instruments* of the *old Romans, Greeks, &c.* But had they been of some *Resemblance*, yet I cannot see that those *Figures* in *Speed* are of any *Authority*. For tho' you guess that they were copied from *old MSS.* yet I could never yet meet with any *MSS.* of our *British History* that have any such *Figures*. If ever any one had them, we have reason to presume that other *Books* upon the same *Subject* would have retain'd them; at least we ought not to doubt it of *Copies* of the same *Author*. That is the *Method* observ'd in other Sorts of *MSS.* The *Illuminators* were generally left at liberty as to the *Ornamental* Parts of the *Great Letters*; but when any *Figures* were to be depicted that should illustrate and explain the *Author*, there they wereto be *exact* and *punctual*, and they had no more Allowance to *alter* them than they had to *alter* and *interpolate* the *Text* of the *Author* himself. Hence I am inclin'd to think that these *Figures* are *modern*, and are owing to Mr. *Speed* himself. 'Tis also what himself insinuates in the same *Chapter*, acknowledging that they were adapted to the *Descriptions* given of the *Britains* in *antient Authentick Authors*. But not to examine other *Particulars*, the *Form* of the *Spears* in their Hands is not countenanc'd by any *Authority* of Note. For tho' *Herodian* has acquainted us that they used *short Spears*, yet he is silent as to the *Make* of them. Nor indeed have we any where a good Account of the *Military Arms* of the *Britains*. The *Authors* transmitted to *Posterity* by them are modern in comparison of the *Roman Writers*, and are withal *Romantick* and not to be rely'd on. And as for the *Bards* they took no care to transmit to *Posterity* these *Weapons*, or to give us *nice Relations* of their *Countrymen*. 'Tis true, there have been and are still found several *Instruments* made of *Flint*, which the best *Judges* esteem to be *British*. The *Flint Heads* of their *Arrows* are commonly called in *Scotland* *Elf-Arrows*, as being

being supposed to have an *extraordinary Virtue* against the *Elves*, and to drop from the *Clouds*. There are other *Flints* somewhat in form of *Axes*, and these Dr. Plot calls (d) *British Axes*; but Dr. Leigh thinks (e) they are *Indian*. Sir William Dugdale inclines to the Opinion embrac'd by Dr. Plot, and he acquaints (f) us with several of about four *Inches* and an halt in length, curiously wrought by *Grinding*. But they might as well have been *Roman*, the *Romans* having used *Flint Weapons* as well as the *Britains*, and 'twas from the *Romans* that the *Britains* learn'd the *Art* of working them. That which also seems to make us believe that they might be *Roman*, is that those mentioned by Sir William were found at *Oldbury*, *Aldbury* or *Ealdbury*, which was a *Roman Fort*, and is the same in Signification with *Alcheſter* in *Oxfordshire*, *Alcheſter* being nothing else but *Ealdbury*, so call'd by the *Saxons* to shew that 'twas a Place of *Antiquity* even in their *Time*. And tho' the *Anonymous Author* of the *Antiquities* of *Alcheſter* at the End of the *Parochial Antiquities* of *Ambrosden* derive it from *Allectus*, as if he were the *Founder*, yet there is no *Authority* either from *Coyns*, *Inscriptions*, or *Books* to countenance the *Conjecture*.

§. 3. Now since there are no *Authentick Authors* by which we may learn what *Arms* were made use of by the *Britains* in their *Wars*, I can think of no properer *Method* for finding this out than by seeing what *Arms* were in use amongst those *People* from whom they immediately had their *Original*. Mr. *Sheringham*, who was a learned *Man* and endued with an accurate *Judgment*, inclines to the *Story* of *Geffry* of *Monmouth*, who deduces the *Bri-*

(d) Loco supra citat. (e) *Natural History* of *Lancashire*, lib. I. p. 181.
 (f) *Antiquities* of *Warwickshire*, pag. 778.

tains from the *Trojans*. And this is the Opinion too of several other learned Men. But whatever their *Abilities* and *Authority* might be in other Respects, yet in this they must be reckon'd *partial*, and I rather strike in with those other *Writers* of more *authority* who derive the *Britains* from the *Gauls*; amongst whom Mr. *Camden* is chief. He has *diligently* and *nicely* prov'd that the *Gauls* and *Britains* had the same *Religion*; that they *both* had their *Bards* and *Druids*, enjoy'd the same *form* of *Government*, us'd the same *Method* of *Fighting*, had the same *Natural Genius*, were equally *candid* and *innocent*, were addicted to *change* when provok'd, were *compassionate* to their *Relations*, and always ready to partake in their *Vindication*. He has withal shew'd that they *both* affected great *Numbers* of *Servants*, that their *Buildings* were alike and were surrounded with *Woods*, that they *both* usually wore *Chains* of *Gold* about their *Necks*, and had *Rings* on their *Middle-Fingers*; that they *both* wore *long Hair*, and that the *Garments* call'd *Brache* were common to each. These Things he confirms from the *best* and *most* approved *Authors*. And as the *chiefest Argument* he has alledg'd *Variety of Instances* to shew that they spoke the same *Language*. Mr. *Sheringham* himself was aware of this, and therefore to evade the *Force* of the *Argument* he makes (g) the *Trojans* to come through *Gaul*, which being then thinly inhabited, he says *Brute* and his *Companions* soon conquer'd it, built a *City*, and continued there 'till such time as they had well peopled it, after which they pass'd over into *Britain*, and by that means the *Britains* came to have the same *Language*. This is his *Hypothesis*, which is so far from deserving *Approbation*, that it does not seem consistent with usual *Prudence*, nor with the other *wise Acts* that are ascrib'd to *Brute*. For no one that *rightly* considers can think that *Brute* would voluntarily leave so large a

(g) See his *Book de Origine Gentis Anglor.* pag. 7. & seqq.

Country as *Gaul* for one that was so much *less*. It is therefore more likely that the *Britains* had their *immediate Original* from the *Gauls*. *Cæsar* himself thought so as to those that inhabited more near the *Coasts*, notwithstanding his *Observation* that the *Midland People* were *Aborigines*. Nor will *Boxhorn's Assertion* that the *Gallick Tongue* was the same with the *Scythian* overthrow this *Hypothesis*. For it may very well be supposed that the *Gauls* came first from the *Scythians*, who are in *Justin* (b) observ'd to have been the most *antient People*, and to have contended with the *Ægyptians* on that *Score*. This will *exactly* agree with what *Camden* and others have asserted concerning the *Gauls* being descended from *Gomer*, the *eldest Son* of *Japhet*. I know indeed that *Mr. Sammes* derives the *Scythians* from *Magog* the *second Son* of *Japhet*. But (not here to take notice of his contradicting himself in this *Point*) since *Strabo* (i) and *Stephanus* (k) mention a *City* call'd *Gogarena* between *Colchis* and *Iberia*, and since the *City Hierapolis* in *Cælo-Syria*, according to *Pliny* (l), was call'd by the *Syrians* *MAGOG*, 'tis more probable that *Magog* seated himself in those *Countries*, near to which 'tis agreed his *Brethren* settled, than that he wandred so far out of the *Way* from them. Here I cannot but take notice that the *Britains* were like the *Scythians* a *frugal People*, and their *long Lives* (they often living to the *Age* of 120 *Years*) might in great measure be ascrib'd to their *Temperance*, and their *Milk Diet*, (just like the *Hippomolgs* mentioned by *Homer* (m). And as *Æschylus* tells us that the *Scythians* were ἵππικὸς βοτῆρες εὐρύμοι a *just Nation* and *addicted to the Feeding of Horses*,

(b) Hist. lib. II. c. 1. (i) Lib. II. (k) De Urbib. [æc. Γαλαρῶνι.
(l) Nat. Hist. lib. V. c. 23. (m) Il. XIII. v. 3.

so the same may be said of our *antient Britains* who were very *religious* and observ'd the *Rules* of their *Priests*, and took extraordinary *Delight* in *Cattle*, whence perhaps they might affect to have the *figures* of *Beasts* cut upon their *Bodies*. From what has been laid down I hope 'tis plain that the *Gauls* and *Britains* were of the same *Original*. What we have next to do is to see what *Arms* were us'd by the *Gauls*. There are several *Authors* that have written of the Nature of them, and particularly *Cluver* and *Boxhorn*. Their *Names* are *Spatha*, *gessum*, (*gesum* or *gasum*) *lancea*, *sparum*, *cateia*, *mataris* or rather *materis* (not *matara*, *machera*, *uists*, *uists*, *uists* or *uists*) *thyreos*, and *cetrum* or *cetra*. I shall not here insist upon the Signification or reason of the *Names*, but only observe in general that the *gessum* was a *Javelin*, the *sparum*, *cateia* and *mataris* were different Sorts of *Darts*, and that the *thyreos* was an *oblong* and the *cetrum* a *short sort of Shield*. So that the *Spatha* only remains (for the nature of the *Lance* is well known) to be compar'd with the *Weapons* we are considering. 'Tis call'd by the *Italians* *SPADA*, and by the *Spaniards* *ESPADA*. From the *Description* that *Isidore* has left us of it, we are inform'd that 'twas a *two-edg'd Sword*, with which they *cut* and did not *thrust*. Whence 'tis plain these *Arms* had not *sharp Tops*, agreeable to what *Livy* (o) has related that their *gladij* were *prælongi*, ac. *sine mucronibus*. And *Polybius* has the same reason why they did not *push* with them. Hence it is clear that our *Instruments* which have not *two Edges*, but are *dull like wedges* were not *spathæ*, and since they do not agree to any of the other *Gallick Instruments*.

(n) See *Livy lib. VIII. c. 24. Edit. Oxon.* (o) *Lib. XXII. c. 46 Edit. Oxon.*

we must carry on our *Inquiry*, and examin whether they agree with any of the *Arms* of some other *antient Nation* that made a *Figure* in *Britain*.

§. 4. Our *Ancestors* the *Saxons* will have no share in this *Inquiry*. For 'tis plain from the *History* of them given by *Verstegan*, and the *figures* publish'd also by him, that *Spears*, *Halberds*, *Shields*, *Cross-bows*, *Swords*, (which were broad and bowing, somewhat in fashion of a *Sythe*;) and *Hatchetts*, which they call'd *Bills*, were the *Arms* made use of by them; nor did the *Weapons* of the *Danes* that succeeded them much vary if at all. Coming from the *same Parts* they us'd the *same Customs* in their *Military Undertakings*. For tho' the *Normans* endeavour'd to make an *intire Alteration*, yet they found the *Attempt* impracticable, and they were forc'd to acquiesce, and lay aside their *Proposals*, which thwarted so very much those *antient Customs* that were here generally entertain'd, and receiv'd. But however notwithstanding these *Instruments* do not resemble either the *Saxon* or *Danish Military Arms*, yet I find in *Wormius's Museum* (p) two *Cimbric Instruments* with which they have some *likeness*. These he tells us were of *Brass*, and he calls them *Wedges*. The larger of them was five *Inches* in *length*, and three in *Breadth*. He is of opinion that they were us'd in the *Wars*, especially when the *Armies* were very near each other. If they had *Holes* by which they might have been fix'd to *Helves* he would have believ'd them to be *Battle-Axes*; but being neither *hollow* (as ours are) nor having no other way of being fasten'd to other *Instruments*, he concluded that the Name of *Wedges* might be most proper. A very ingenious Gentleman some time since inform'd me

that much such *Instruments* had been found in the *Iſle of Man*, and that a great many *Urns* had been alſo diſcovered there, as likewise divers *Inſcriptions* with *ſtrange Characters*. I do not queſtion but the *Inſcriptions* are *Runic*. And 'tis highly probable that the *Inſtruments* were like thoſe in *Wormius*; but if they agree exactly with ours they will from what I ſhall ſay by and by appear to be *Roman*. For notwithstanding it be commonly held that the *Romans* never were in this *Iſle*, yet I ſee no other reaſon why it ſhould be thought ſo, than that the *antient Authors* now remaining do not mention it. This is only a *negative Argument*, and what we ought not to lay a very great *Streſs* upon. The *Urns* ſeem clearly to evince that they were here. I know indeed that 'tis ſaid that theſe *Urns* muſt be perfectly *Daniſh*, by reaſon of the *ſmall black Bones* and *Aſhes* found in them; which however is no *ſure Ground* to go upon. For I have ſeen in the *Bodlejan Repoſitory* a Piece of a *Roman Urn* which was dug up ſeveral *Years* ago at an *old Roman Town* in *England* with many others, ſome of which were of *different Figures*. 'Tis now in a *Box*, and with it are *little black Bones*, *Aſhes*, &c. wrapped up in two *Pieces* of *coarſe Linnen*. This *Linnen* is in the ſame figure with the *Urn*, but the *Urn* for one of the *Pieces* is wanting. The *Smallneſs* of the *Bones* ſhews that they are the *Relicks* of *Children*. It was cuſtomary among the *Romans* after the *Bodies* were burnt to waſh the *Bones* with *Wine* and *Milk*, and afterwards the *Women* wrapt their *Children* in *Linnen*, dry'd them in their *Bosoms*, and then put them into *Urns* to be buried. This *Cuſtom* was alſo peculiar to the *Danes*, who learn'd it from the *Romans*, from whom likewise they receiv'd *Urn-Burial* it ſelf. Such *Urns* too are mention'd by the famous *Sir Thomas Brown* to have been found at *Old Walingham* in *Yorkſhire*. Nor is the *Roman Hiſtory* altogether ſilent of the *Iſle of Man's* being known to the Ro-

mans. For *Plutarch* expressly tells us, that one *Demetrius* sailed hither, as well as to other *British Isles* in the Reign of *Adrian*. 'Tis no wonder that *Runick Inscriptions* are discovered in the *Places* where *Roman Urns* are found. Those *Inscriptions* might have been made upon other occasions after it became in future *Ages* inhabited by *Danes* and *Norwegians*. The same *Accident* has sometimes happen'd in *England*. And Mr. *Camden* particularly relates in the Close of his *Discourse* concerning *Stone-Henge*, that in the Time of King *Hen. VIIIth.* was found at *Stone-Henge* a Table of mixt Metal on which were ingrav'd many Letters, but the Character was so strange that neither Sir *Thomas Elyot*, nor Mr. *Lilly*, the famous *School-Master* of *St. Paul's*, could tell what to make of them, and so there was no care taken to preserve the Monument, the Loss of which was afterwards much lamented by *Olaus Wormius*, who thought it to be *Runick*, as without question it was: and yet *Stone-Henge* itself is a *Roman Work*, as has been made out by Mr *Inigo Jones*, who tho' he was confuted by the late learned *Dr. Charleton*, yet Mr. *Jones's* Opinion was very well defended by Mr. *John Webb*, who has in his *Book* distinctly examined the *Methods* made use of both by the *Romans* and the *Danes* in their *Buildings*.

§. 5. Having proceeded thus far in this *Inquiry*, and shew'd that these *Instruments* were not *military Arms* either of the *Britains*, or of the *Saxons*, or of the *Danes*, I shall now carry it on farther and endeavour to prove that they are owing to the *Romans*, which is what I have before insinuated. I once thought that they were a sort of *Axes* which the *Romans* made use of in their *Sacrifices*, of which *Dr. Plot* takes notice of two sorts, the *secures Lapidææ* and the *secures Cuprææ*, tho' *Dr. Leigh* will have his *Instances* to be both *Indian*. Upon a more narrow consideration of the *Roman* sacrificing *Instruments*, I have quite chang'd

chang'd this Opinion, not finding the least *Footsteps* of such *Axes* in any of the *Books* of *Roman Antiquities* I have hitherto consulted. On the contrary they are in the *Snovetaurilia* or *Solitaaurilia* of the *Columna Trajana* represented in the same *Form*, and fastened in the same manner, that we use at this Day. And so also in other *Sacrifices*, as may partly be seen in the *Gemms*, *Rings*, &c. publish'd out of the *Studies* of *Augustinus*, and *Gorlaeus*, as well as in the *Monuments* of *Gruter*, *Reinesius*, *Spon* and *Fabretti*, to omit the *Authors* collected upon this Subject by *Grævius* in his large *Body* of *Roman Antiquities*. Neither could they have been the *Heads* of *Spears*, as is manifest from the same *Authorities*. The *Roman Spears* and *Javelins* occur very frequently, and yet not one of them either on their *Coyns* or elsewhere is to be met with in the *Figure* of these *Instruments*. 'Tis true some of their *Spears* had two *Heads*, so they might use either *End* uppermost as they pleas'd. We have one of these in *Augustinus* (q). The *Heads* differ from one another, but they neither of them answer our *Monuments*. Nor are the most antient *Spears* of the *Romans* we meet with different from those they made use of in more modern Times, as may in some measure be seen in the famous *Shield* lately published at *Oxford* (r), which is certainly *authentick*. It's *Antiquity* is defended in the *Place* I have cited. It may here be farther added to what is there alledg'd that *Lucius Florus* gives (s) us the first *Instance* of the *Romans* fighting upon *Horses* without *Bridles*; and in the *Columna Trajana* (t) the *Horses* are placed in full speed with their *Riders* without any *Bridles* or other *Curbs* to restrain and guide them,

(q) *Gemm. & Sculpt. antiq. ex Edit. Jac. Gronovii* Franeg. 1694. Part. num. 155. (r) *Vide* *Livi*, Edit. Oxon. Vol. VI. p. 195. (s) *Lib. I. c. 9.* (t) *Num.* 199.

a great many of the *Romans* having made themselves *Masters* of this *Method of Fighting* that they might like the *Numidians* (who were famous for it) be the less incumber'd in the *Battle*, and rush upon the *Enemy* with the more *Force*. Their *Desultories* also are *Proof* enough of it's being practicable.

§. 6. But now tho' these *Instruments* are not properly *Roman military Weapons*, such as they us'd in their *Battles*, yet they were of service amongst the *Souldiers*, and good Numbers of them were constantly provided to be carried about in the *Army*. For I believe that they are *Roman Chissells*, and that they were us'd to cut the *Stones*, and other *Materials* that were judg'd serviceable for building their *Camps*. This is not *Conjecture* only as appears from the *Columna Trajana*, where (u) the *Souldiers* are represented polishing the *Stones* for the *Roman Tents* in the *Dacic Wars* with such sort of *Chissells* made of *Brass*. These *Chissells* they beat and worked into the *Stone* and other *Materials* with *Mallets* of the same *Metal*. We have other *Instances* of it in the same *Pillar*, which is one of the best *Monuments* we have by which to judge of the several *Instruments* made use of by them in their *military Enterprises*. These *Chissells* were of admirable service in making their *Aggeres*, which consisted of *Earth*, *Stones* and *Timber*. The *Stones* were sometimes thrown together without any *polishing*; but that was more rarely; and 'twas look'd upon as a better *security* to have them work'd that they might lye even. By this *Account* the reason will be easily perceiv'd why these *Instruments* are hollow, namely to fasten *Handles* to them for more convenience in driving them. If

they had been *Wedges*, 'twould have been a great *Inconvenience* to have had them *hollow*. Besides the *Wedges* by being drove into the *Wood* or *Stones* would have been *strangely* worn on the *Sides*, and have receiv'd considerable *Alterations*, whereas the *Sides* of ours in the *Bodlejan Repository* (and I suppose your's are so too) are just as they were at first, and there is not the least *Change*, unless it be on the *Edge*, which is very *blunt* and much *broken*, which I guess to have proceeded from the *Stone*. As for the *Ears* or *Loops*, 'tis probable they might be put on that thereby the *Handles* might be fixt the better; or perhaps they were design'd for the *Ease* of the *Souldiers*, who in their *Journeys* might by this means fasten them to their *Girdles*. For I believe most if not all the *Souldiers* had such *Instruments*, which they were oblig'd to make use of when *Necessity* requir'd. I know that 'tis the opinion of most that there were a few particular *Persons* always in the *Army* to whom these *Works* were committed, and that they were *exempt* from the Office of *Souldiers*, and that they were *marmorarij*, *quadratarij*, *tignarij* and *structores*. These may be call'd all by one Name *fabri murarij*, tho' that is commonly reckon'd only another Name for *structores*. But this is a wrong *Perswasion*, and *Fabretti* has (w) well observ'd that there are no *fabri murarij*, as they are taken for *Artists* distinct from *Souldiers*, on *Trajan's Pillar*. This *Observation* he has made in opposition to *Santi Bartoli*, who calls them expressly *fabri murarij*. *Fabretti's Remark* as 'tis very just with respect to this sort of *Artists*, so it must be noted that there were no other distinct *Artists* that were freed from the *Dutys* of *Souldiers*. Even the *Artists* that had receiv'd *liberal Education* are to

(w) Syntagm. de columna Trajana pag. 208.

be comprehended in this *Observation*, I mean their *Physicians*: which is the reason that in *Fabretti* we have (x) the *Picture* of a *Physitian* fortified with a *lorica* or *Coat of Mail* and moving his *Hands* to a *sick Person* that was his *Patient*. The *lorica* shews he was one of the better sort of *Souldiers* call'd *evocati*, those of the inferior Order being allow'd only a *Pectoral* of *thin Brass*. It withal points out to us that he was after he had finish'd these *Offices* to the *Sick* bound to betake himself to the other *Offices* of a *Souldier*. This was sometimes intermitted, but in *Trajan's* strict *Discipline* 'twas always observ'd, he being resolv'd to imitate and bring into *fashion* the *Severity* that had been made use of in the more *antient Times*. For this reason we see the *Souldiers* in this *Pillar* duly exercising and performing, when there was any need, all the *Offices* of *Tradesmen*, it being at this time *customary* to list *Tradesmen* amongst the *Souldiers* for this *Intent*.

§. 7. Besides the Uses these *Instruments* were put to in forming the *Roman Camps*, they were moreover employ'd in making and repairing the *High Ways*, which swallow'd up a large *Quantity* of *Stone*, especially in such *Places* as were *marshy* and *Fenny*. The *Pomptin Marshes* were vastly large, and yet at such *Time* as the *Souldiers* were too many to be us'd against the *Enemy*, a motion was made that they should be employ'd to *drain* them, which was so well approv'd, that the *Senate* immediately gave Orders for it, and the *Soil* was so rich and fertile that great Numbers came and settled here, insomuch that there were no less than XXXIII. *Towns* built upon the *Ground*. The *Waters* however afterwards got strength again, and 'twas in a manner wholly drown'd; which made *Julius Caesar* entertain some Thoughts of draining

(x) *Loco cit.* pag. 217.

them *afresh* and of carrying the *Appian Way* through them, whereas it had before went about them; but he fail'd in his *Design*, and 'twas left for one of his *Glorious Successors* the Emperor *Trajan*, who after he had cleans'd the *Fens*, caus'd a *Stone Way* to be made through them, whereon were built large *Inns* and *magnificent Bridges* for Conveyance of the *Water* which was in the upper Part of the *Marsh*. For memory of which he had a *Monumental Stone* erected with a proper *Inscription*, by which it appears that the *Way* was *XIX Miles* in length, there being plac'd at the End of every *Mile* a *Mile Stone*, and from thence the *Way* it self was in succeeding Times call'd *Decennovium*. I might from hence take occasion to mention other *Works* of the *Romans* in *Italy* of this kind, in which *Chissells* were *absolutely necessary* for cutting the *Stones*; but this is needless at present, and therefore I shall only remark that as *Trajan* was diligent about the *Ways* in *Italy* and other *Parts*, so it seems he was no less careful of these *Affairs* in *Britain*. For notwithstanding some tell us that the four *Great Ways* in *Britain* are owing to *Molmutius* one of the *British Kings* and *Belinus* his Son, yet *Mr. Camden* and others have shew'd that they are rather to be attributed to the *Romans*, being repair'd and made as it were quite anew (whereas before they were very *mean*) by *Trajan*, after he had reduc'd the *Britains* to *Obedience*. Besides which *Ways* he also made divers other *Lesser* ones here, and perhaps these *Chissells* that have occasioned this *Letter* may be some of those us'd by the *Souldiers* in his *Reign*, tho' before his Time *Acts* of this kind had been perform'd by the *Roman Souldiers*, who also forc'd the *Britains* to undergo the same *Drudgery*, which occasion'd them to complain to *Agricola*, as if they were too *severely* and *hardly* dealt with.

§. 8. If it be ask'd how it comes to pass that these *Instruments* are of *Brass* rather than of any other *Metal*? it may be reply'd that they as well as the *People* of other *Nations* in former times thought there was an *extraordinary virtue* in *Brass*. Whence it was that they us'd *brass Instruments* when the *Moon* was in an *Eclipse* (y), thinking that by beating of them she would the more easily be recover'd from her *Labour*, which *custom* almost *universally* prevail'd. And 'twas upon account of this *peculiar Virtue* suppos'd to be in *Brass* that the *Instruments* made use of in the *sacred Offices* were in the more *early times* all of *Brass*, that the *Tuscans* us'd *Brass Plowshares* when their *Cities* were built, and that the *Priests* of the *Sabins* were shav'd with *Brass Razors* (z). *Hesiod* himself tells (a) us that the *Antients* us'd *Brass Instruments* before *Iron* ones :

Χάλκῳ δ' ἔργαζοντο μέλας δ' οὐκ ἔσκε σίδνερος.

At which time not only their *Arms* but their *Houses* were likewise of *Brass*.

Τοῖς δ' ἦν χάλκεα μὲν τεύχεα, χάλκεοι δὲ τε δικοί. (a)

The *Custom* might prevail as well in *Britain* as elsewhere, *Iron* being not so very plentiful in the *first time* of the *Romans*, however it might increase afterwards when the *Bath-Forge* was erected, and all *proper Methods* us'd upon that occasion. Nor ought it to be wonder'd how the *Brass Chissells* could be apply'd to the *Stone* without *breaking* to pieces immediately, any more than that the *Ploughshares* did not suffer the same *Damage* in casting up the *Ground* and *grating* against the *Stones* with more *Violence*. The *Brass* in those early times was of a different nature from ours, and so temper'd as to endure much longer with less *inconvenience* in the several *Operations* to which employ'd.

§. 9. I have finish'd what I have to say at present upon these *old Instruments*. As for another Piece of *Anti-*

(y) See Livy lib. XXVI. c. 5. Edit. Oxon. (z) Vid. Rhodigini antiq. Lect. l. XIX. c. 10. (a) Eργ. 2. Hæ. lib. I. v. 150. (b) l. i. v. 149.

quity which you tell me you have in your *Collection*, namely a *Spur* that is no less than 6 *Inches* and an halt long from the *Heel* to the *Middle* of the *Rowell*, which you take to be of a much later Date than the other *Monuments*, we have one in the *Bodlejan Repository* of much the same length, of which I have made mention in my *Additions* to Sir *John Spelman's* Life of King *Ælfred*. There have been several others found in *England*, and you have justly guess'd yours to be more modern than the other *Instruments*. For these *Spurs* are certainly *Danish*, as appears from *Wormius's Monumenta Danica* (d), where he has given us the *Figure* of one, and there is an *Account* of divers others towards the latter End of his *Museum*, one of which is a foot and some odd *Inches* in length.

§ 10. I have been the more particular upon this *Subject*, because I do not remember that it has as yet been treated of by any of our *Antiquaries*, and I was willing to discuss several *Points* that occasionally offer'd themselves when I began to consider it. *Conjectures* in *Affairs* of this nature are allowable, and accordingly I have made use of them; but I have endeavour'd to keep my self within the *Bounds* of *Modesty*, and I leave the whole to your better *Sagacity*. If I have suggested any thing that may be of use to you, as well as serve to gratify your *Curiosity*, it will be abundant Satisfaction to,

Oxon.

Sir,

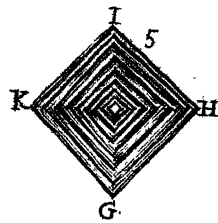
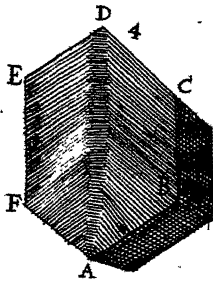
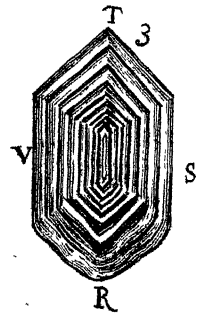
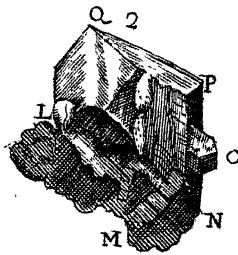
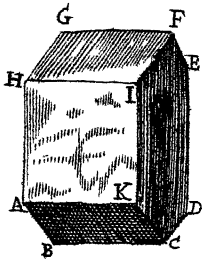
1709.

Your oblig'd humble Servant

Tho. Hearne.

(c) Pag. 43. (d) Pag. 50.

Fig: I.



PHILOSOPHICAL TRANSACTIONS.

For the Months of September and October, 1709.

The CONTENTS.

- I. **A** Letter from Mr. James Yonge, F. R. S. to Dr. Hans Sloane, S. R. Secr. concerning a Bunch of Hair voided by Urine.
- II. A Letter from Mr. Ant. Van Leeuwenhoek, F. R. S. containing his Observations upon the Hair mention'd in the foregoing Letter, &c.
- III. A Letter from Mr. James Yonge, F. R. S. to Dr. Hans Sloane, R. S. Secr. concerning several Solid Bodies voided by Urine.
- IV. A Letter from Mr. James Yonge, F. R. S. to Dr. Hans Sloane, R. S. Secr. containing an Account of an Unusual Blackness of the Face; and of several Extra-Uterine Foetus's.
- V. An Extract of an other Letter from Mr. James Yonge, F. R. S. upon the same subjects as the former.
- VI. An Account of three Cases of the Hydrophobia. By R. Mead, M. D. F. R. S.
- VII. An Account of an Experiment, ~~and~~ an Attempt to produce Light on the Inside of a Globe-Glass lin'd with melted Flowers of Sulphur, as in the Experiments of Sealing-Wax and Pitch. By Mr. Fr. Hauksbee, F. R. S.
- VIII. A Letter from Mr. Antony Van Leeuwenhoek, F. R. S. Containing some Microscopical Observations on the Particles of Crystalliz'd Sugar, &c. and his manner of Observing the Circulation of the Blood in an Eel.
- IX. Part of a Letter from Mr. B. Sherman to Dr. Hans Sloane, R. S. Secr. concerning the Bones of a dead Foetus, taken out of the Uterus of a Cow; and of a Callus that supplied the Loss of Part of the Os Femoris.

I. *A Letter from Mr. James Yonge, F. R. S.
to Dr. Hans Sloane, S. R. Sec. concerning a
Bunch of Hair voided by Urine.*

A Plethorick Woman about Fifty Years old, that used often to be afflicted with Nephritick Pains, employ'd me to relieve her the Ninth of May last. I found by the Purulency and Stench of her Urine, that she had not only Stones and Gravel, but an Ulcer in one or both her Kidneys; and therefore gave her a Dose of *Cantharides* with *Campfire* made into Pills, and follow'd it with plentiful Draughts of a slippery Emulsion. This made her piss off abundance of blackish Gravel, and white thick Matter like Bird-Lime, without any Pain or ill Symptoms, and she continued easie for a Week; then her Pains returned, and went off by the same Remedy. About Eighteen Days afterwards her Pain seeming to threaten a return, I repeated the Medicine; but that Night it gave her very great Pain in the side of her Belly, and at last threw her into Convulsions, which went off upon the Discharge of Urine, of a great deal of Matter, and in it a Bunch of short Hair almost rotten: For some time after she used a Nephritick Course, which hath hitherto preserved her from the Return of Pain, Matter, Stones, and Impediment of Urine.

I here-

I herewith send you a third part of that Bunch,
which the last Dose of *Cantharides* forced from her;
and will make no Descants on it, but leave it to
those Learned Gentlemen before whom you shall
lay it.

Plimouth, Sept. 28.
1707.

I am Yours, &c.

James Yonge.

II. *A Letter from Mr. Ant. Van Leeuwenhoek, F. R. S. containing his Observations upon the Hair mentioned in the foregoing Letter, &c.*

Delft, Nov. 22. 1707.

Honourable Gentlemen,

IN your Letter of the 24th of *October* last there was inclosed a small Lump of a hairy Substance, which was discharg'd by a Woman about 50 Years old or upwards, after she had taken a Dose of *Spanish Flies* given her for an Ulcer in the Kidneys.

I viewed part of the hairy Substance thro' a Microscope, and judg'd it to be the Hair or white Wooll of a Sheep; which Wooll was broken into such small or short Particles, that some of 'em were no longer than six Diameters of the breadth of a Hair; which I suppose could not proceed from the Body of a Man, but that it was rather found in the heel of ones Stocking. And the oftner I repeated my Observations, the more I was confirm'd in my Opinion; for I could not only discover the short broken woolly Particles but I saw also a great number of the Ends gauded to pieces as it were; inasmuch that not only the Bark (if I may so call it) or outside of the woolly Particles were rubb'd off, but the inward little Fibres, of which the Wooll is compos'd, were so disjoin'd from one another, that they appeared with their ends like little Barbes.

More.

Moreover under the said Stuff or white woolly Parts, there lay very small Particles composed of exceeding slender little Tubes or Pipes, which I look'd upon to be small bits of Straw, and they were so small, that one grain of Sand cou'd cover 'em ; there were likewise other small Particles of the same figure, but I did not take them to be Straw, but rather the outmost Husk or Skin of a Grain of Wheat or Rye ; and under those I saw one Particle cover'd all over with small Hairs, such as we see at the top of Wheat or Rye ; as likewise some few little bits of Wood, somewhat thicker than a Hair of ones Head: there was also a small Particle of the outmost Skin of a Man, for I could see the little Scales of which our outmost Skin is composed very plainly ; Now these Particles that were not Wooll, might be very easily brought into the Stocking, in case one sets ones bare Foot upon the Floor before one puts it on.

There lay moreover in the said Matter an unspeakably great Number of exceeding slender long Particles, which I imagine to be those hairy Particles, of which a little Fibre of Wool (setting aside the Bark or Skin of it) is composed ; as also several earthy Particles, which I took to be part of the Dirt of the Floor, or of the Foot itself.

There also lay a great many particular little Figures, which I cou'd not discover what they were, and these last mentioned Particles were so strongly joyned to some little Hairs or Wool by the perspired viscous Matter from the Foot, as I suppose, that I could not separate 'em but by the help of some Water : amongst others I also saw two slender Particles lying, which I should likewise have taken for the outmost Skin of a Man, were it not that they were larger than any of the Scales that I could ever take from my Skin, which are mostly of an equal thickness, wherefore I gave over this Thought. In short there appear'd to my Sight so many and such particular Figures, that there was no Account to be given of them; only I

About a Year ago I had in my Houſe the Gut of an uncommon great and fat Cow, a part of which I blew up, but not much, leaſt the Membranes of it ſhould be too much extended, but I made no Draught of that Obſervation; but I imagined that I obſerved one Membrane of the ſame in which there lay abundance of little Fibres, length-ways, and very regularly one by another; and in another Membrane in the ſame place, lay other Fibres croſs-ways, that ran from the Centre to the Circumference of the Gut; from which Obſervation I ſuppoſe that that motion which we ſee in the Guts, as ſoon as they are taken out of an Ox, is the motion that Nature uſes, to protrude, and diſcharge the Chyle out of thoſe Parts.

I alſo took the Bladder of that Beaſt, and blow'd it up as big as two common Fiſts, to the end that I might better ſeparate or diſtinguiſh the Membranes of it, and ſo let it dry; and having cut it through at about two Fingers breadth from the Neck, I judged that there were twelve Membranes lying one above another, and I put the Microſcope (before which a little piece of that Bladder was placed) into the Hands of a Perſon that ſtood by, deſiring him to obſerve how many times double he ſaw the ſaid Membranes lying, when he ſaw the ſaid Obſervation of them: I was likewiſe ſatisfied that the ſaid Membranes were ſeparated from each other, to the end that the Bladder might be extended into a larger ſpace.

Antony van Leeuwenhoek.

III. *A Letter from Mr. James Yonge, F. R. S.
to Dr. Hans Sloane, R. S. Secr. concerning
several Solid Bodies voided by Urine.*

Honoured Sir,

Yesterday I did again examine the Woman from whom the Bunch came, as also her Daughter, and Servant that attended her when it was ejected ; and they all affirm that the Chamber-Pot used was a White glazed one, and very clean ; and the Woman tells me she sensibly felt it when it came away, and that a Tumour which she felt in one side of her Belly, did thereupon vanish. That ever since, which is eight Months, she hath been unmolested with those Torments, and other Symptoms which seized her frequently before, as I related in my last : only now and then some small Pains happen about her Loins ; and sometimes she brings off Mucilage in her Urine.

I am not very credulous, nor did I soon believe it possible for Hair to pass through those impervious ways, by which the Urine is conveyed to the Kidneys, &c. and its natural Cistern. But when I considered all the Circumstances, and how frequently things unaccountable happen, the truth of which we are well assured, and that many like this, and some more strange are related by Authors of the best Credit, and many as surprizing (perhaps much more so) have occurred to me within a few Years in this Country ; I make no doubt of its truth.

The

The Authors and Stories are numerous. *Diemerbroeck Anat. lib. 1. c. 17.* mentions divers of his own Knowledge, and many more from *Plutarch, Langius, Alex. Benedictus, J. M. Helsius, J. Alexandrinus, N. Florentinus, P. Pigeus*, and others, That Needles, Lumps of Fat, Iron Keys, Roots, Seeds, Nails, &c. have come off in Urine. To these may be added *Tho. Bartholinus, Aët. Med. Vol. 2. Obs. 125. Vol. 3. Obs. 68. Vol. 5. Obs. 57. 70.* As also in his *Tr. de Lact. Thorac. Cap. 6. 9. Fabr. Hildanus, Cent. 5. Obs. 51.* who write of Pins, &c. cast off by Urine. But our Country-Man *Dr. Farfax*, writes of one more strange; A Leaden-bullet swallowed by a Woman for the Cholick, was piss'd off some Years afterward, incrustated with a gravelly, gritty, and stony Accretion. The Story is published by *Mr. Oldenburgh, Ph. Tr. No. 40.* to which I refer.

About twenty Years since I was assured by a Physician practising in the West Part of *Cornwall*, that he knew a Woman that piss'd out a small Plumb-Stone. But there happen'd at *Loo* in the same County, about 16 Years ago, a more surprizing Accident of that sort, which I here set you down as I had it from the Pen of the Physician concern'd, who is alive, and the Truth of it well known in and about the Town where it happen'd.

' *Nathaniel Mitchell* of *Loo* in *Cornwall*, aged about
' 50, was in the Summer 1690, seized with violent Co-
' lical Pains which he mitigated by Glysters, but could
' not perfectly free himself of them. About *Michaelmas*
' 1691. his Pains being very violent, he was relieved by
' the same Remedy; and by the persuasion of a skilful
' Woman, he drank the Powder of Nettle-roots in
' White Wine: After the first or second Dose he dis-
' charged a great quantity of Urine, with a very fecu-
' lent Sediment. About the beginning of *November* 1691.
' being Costive, he eat Mallow roots and Corinths boil'd,
' and

and mixed with Butter, (his usual Medicine to render him Laxative.) In a little time after eating it, he was much disordered, and complained of an Oppression by Wind; at length the Wind (as he termed it) settled at the bottom of his Belly, and in a very little time with his Urine he emitted some of the Herbs, with above 40 Corinth: A few Days after he piss'd off several Parsley-Leaves, which he had a little before eaten. I was called to him about the 12th of November, when his Urine being shewn me, I thought that part of his Excrements had been evacuated that way, and that some Latent Ulcer had made a Passage through the *Intestinum Rectum* into the Bladder, but found it otherwise; for there was no Faecor in the Urine, he had no *Tenesmus*, nor bloody, nor purulent Dejections; but to satisfy myself further in this Particular, I ordered him a Glyster tinctured with Indigo, which he retained above half an hour, but his Urine was not at all discoloured with it. I prescribed Pills of—, two of which came off in his Urine November 18. in an oblong form, about the bigness of the end of the first Quill in a Goose's Wing. The Pills I have by me, except the half of one, which I rubb'd abroad with my Fingers. Some time after, he piss'd off a piece of a Raisin. He lived till Midsummer 1692. in which time he ejected at divers times parts of Roots, and other things he eat.

His Wife resisted all the Importunity that could be made to have his Body dissected: So that a great Secret was buried with him.

J. H.

Dicmerbroeck, Farfax, T. Bartholine, O. Borichius, N. Blegny, Mr. Pecquet, and others are of Opinion, that there is a concealed Channel for the Urine to the Emulgen's, &c. than those commonly supposed; and they think it appears so by divers Phenomena, Experiments, Essays, they have made, (though like the Head of Nile

it be yet concealed,) and that their Objections against the common Opinion are insuperable. Its certain the matter of an *Empyema*, and the Corruptions in the Thorax in penetrating Wounds thereof, have been piss'd off, and to that purpose Diureticks are used in Vulneraries, &c. See *Mulpighius*, *N. Blegny*, *Serjeant Wiseman*, &c. And I have known a large ripe Apostumation in the Thigh sink suddenly, and all the Matter come away by Urine from a Woman. Mr. *Leyser* hath the like Story in his Observations. See the *Philos. Tr.* No. 50.

I had once a Boy of about 6 Years old, brought me, that piss'd off the most part of his Urine from an Orifice in his Navel. I remember *Blasius*, or *Veslingius*, relates the like, and accounts for it.

Plimouth, March 9.

1707.

James Yonge

p. 432

IV. *A Letter from Mr. James Yonge, F. R. S. to Dr. Hans Sloane, R. S. Secr. containing an Account of an Unusual Blackness of the Face; and of several Extra-Uterine Fœtus's.*

Honoured Sir,

THE Relation I sent September 1707. of an hairy Bunch ejected by Urine from a Nephritick Woman, I find did not meet that Regard, and Credit which I think it well deserved. I own that Mr. *Leeuwenhoek's* Objections seem to have some strength, but cannot shock my Belief at all: For beside a nice Examination, and full Consideration of all Circumstances at first, I am confirm'd in the Assurance I then had, that it came thorough the *Urethra*, was not convey'd, or by any accident dropt into the Pot, by such Evidence *à posteriori*, as are little short of Demonstration: *viz.* That the Tumour which was in the side of her Belly, in which her chief Anguish lay before the Evacuation, vanish'd with it; together with all those other Symptoms, which molested her; *viz.* Strangury, fœtid and purulent Urine, and have not now in two Years made any return.

I have a couple of other Rarities to present (with my humble Duty) to the *R. Society*; one of them is matchless, and to me wholly new. I will relate it very briefly, because being not yet at an end, I expect occasion to give you a further account of it.

‘ A Girl 16 Years old, a Daughter of *Elizabeth Worth*
 ‘ of this Town, had about the end of last *April* a few
 ‘ hot Pimples rise on her Cheeks, which Bleeding and a
 ‘ Purge or two cured. She continued very well ’till about
 ‘ a Month afterward, when her Face, so far as is usual-
 ‘ ly covered with a Vizard mask, suddenly turned black
 ‘ like that of a *Negro*. This surprizing Accident much
 ‘ amaz’d and frightened the Girl: especially after some
 ‘ foolish People persuaded her she was bewitch’d, and
 ‘ never to be cured: By Prayers, Exorcisms, and other
 ‘ Incantations they endeavoured to relieve and take off
 ‘ the Fascination; which proving ineffectual, the Passion,
 ‘ and Terror of Mind encreased to a great degree,
 ‘ even to Distraction, and then they demanded my As-
 ‘ stance.

By the Arguments I used, and some composing Anti-
 hysterical Remedies, the Violence of her Fits became
 much pacified. I also directed a Lotion for her Face,
 which took off the Discoloration, but it returned fre-
 quently, but with no regularity, sometimes twice or
 thrice in Twenty Four Hours, sometimes five or six
 times. It appears insensibly to the Girl, without Pain,
 Sickness, or any Symptoms of its approach, except a
 little warm Flushing just before it appears. It easily comes
 away, and leaves the Skin clear, and white, but smuts
 the Cloth that wipes it from the Face; it feels Unchious,
 and seems like Grease, and Soot, or Blacking mixt. It
 hath no Taste at all, which is to me very strange, that
 a fuliginous Exsudation should be insipid.

She never had the *Menses*; is thin, but healthful; the
 Blackness appears no where but in the prominent part of
 her Face. There are a thousand Eye-witnesses to the
 truth of this Wonder; but I am not able to find, or

conjecture the caused of it, nor have I ever heard of the like. I shall be glad to know your Opinion, and ready to make such further Enquiries as you shall please to send, in order to discover the cause of this dark and strange *Phænomenon*.

The *second* Rarity I am to impart is extraordinary, but not wholly new, and solitary, as the first is, having been observed by some the last Century. It was communicated to me by a very Learned Divine of this Country, in these Words——; ‘ I send this to acquaint you with a strange Occurrence observed here last Week: A Gentleman’s Servant having kill’d an Ewe, which was thought fat, and taken out the Bowels, found a very unusual and monstrous lump of Fat, proceeding like a Wen from the middle of the *Omentum*. I was call’d to see this Wonder; and having cut it open, found inclosed a Lamb of the same Parts, Feature, and Dimensions with others of that kind. How it came there? And how nourished? are Questions I would have resolved.

I soon apprehended what it was that seem’d so very strange and unaccountable to my Friend, having thirty Years since been shewn the like, found in a Bitch, by an expert and ingenious Surgeon in *Oxford*; and from that time observed, and considered all of that Nature which have occurred to me in Books, or otherwise; and so was ready to tell that Learned, and curious Gentleman, that that Lamb was not conceived in the Womb, but in one of the *Fallopian Tubes*; wherein growing too big to be contained, it either broke out into the place where it was found, or slipped back toward the upper Orifice, and thorough it into the Belly: That afterward assisted by the prone and inclining Posture of the Sheep’s Body, it slipped
for-

forward to the *Omentum*, and was there nourished the usual way, *viz.* by the *Placenta*, which was doubtless fixed in the *Tube*, and the *Pedunculus* being kept whole, will easily extend from thence to the *Fœtus*, where it lay.

Had this Sheep been nicely dissected by a skilful Hand, I verily believe we should have found my Opinion true in fact. *Riolan Jun. Anthropog. Nov. lib. 2. c. 34.* was the first that publicly observed these strange Conceptions; and he tells us they have the Coats, Secundine, &c. of such *Fœtus*'s as are ingendred within the Womb. And considering the late Anatomical Discoveries, and new Hypothesis of the genital Parts in Women, and their uses in Generation, made by *Theod. Kirkringius, Rég. de Graaf*, and others; it seems more than probable, that such Conceptions as we are speaking of, happen when in Coition one of the Eggs descends into the *Tube*; and being unable to pass into the *Uterus* thorough the lower Orifice (which is sometimes, and in aged People always, contracted;) and being however impregnated by the *Aura Seminalis*, or **Animalcula*, wherewith the Testicles and seminal Parts of some Males do so prodigiously and incredibly abound; it there grows'till too big to be contained, and then breaks forth into the Belly: Though sometimes, as I shall shew by a memorable Instance, they continue in the *Tube* it self. There the *Placenta* fixes, and sucks Nourishment as from the *Fundus Uteri*; and if the *Pedunculus* holds together, conveys it to the *Fœtus*, as it doth to those in the natural Place of Breeding.

I have perhaps with too much freedom and too little exactness laid before you my Notions, and the

* *Mr. Lecuenhoek saith, the Milt of a Codfish hath more Animalcula, than there are People on the Earth. Dr. Hook, Phil. Collect. N^o 1*

Idea I have of this Matter; but 'tis with humble Submission to your Censure and Correction: Craving leave to amplify a little on this subject, By reciting what of the kind hath been by several others discover'd, and considered.

Such *Extra-uterine Embryo's* have been sometimes found in Women; but not publickly taken notice of 'till the beginning of the last Century, by the younger *Riolan. ut supra*, with this Remark: (Speaking of the *Fallopian Tubes*) They appear, saith he, of the same Nature and Substance as the Womb, *Quia carnosæ est, in qua, quod est mirabile, fœtum Humanum concipi fuit observatum.* Then gives an account of four such strange Conceptions, which occurred to his Knowledge.

Since which time, more marvelous ones have happen'd in that Country; two of them much amused the Curious every where. One was found at *Paris, January 1669.* by Mr. *B. Vesal*, in the right Tube of a Woman. It was four Months old, and so grown, and the Tube so distended, as made him mistake it for another Womb, and accordingly to call the Account he published thereof, *Demonstration d'une double Matrice.* Mr. *Oldenburgh* put an Extract of it into the *Philosophical Transactions*, No. 48. and the *German Academy*, Vol. 1. Obs. 110. did the like: But neither seem'd to understand the Mystery, 'till *de Graeff* took it right, and made use of this very Observation to illustrate and confirm the Hypothesis of *Kirkringius*. And soon after *Elsholius*, a learned German, did the same in a little but curious Tract, *De conceptione Tubaria, qua Humani Fœtus extra Uteri cavitatem in tubis quindoque concipiuntur.* He recites the Story as from Mr. *Vesal*, and gives the Figure of the supposed two Wombs and the *Fœtus* in the distended Tube; and among other such Conceptions, mentions two large *Mola's* found without the *Matrix* of one Woman.

About

About Ten Years afterward a much more wonderful, and incredible one happen'd there, which puzzled the Philosophers to apprehend, or believe. It comes very well attested by Mr. Bayle, who first published an History of it in the *Journal des Sçavans*, A. D. 1678. Soon after M. Nic. Blegny did the same in a particular Tract with Figures, which I have by me: And afterward Mr. Oldenburgh put an Extract of it into the *Philosophical Transactions*, No. 139.

' A Woman, A. D. 1652. came to her full time of
' bearing, but altho' she had all the Symptoms usual
' at that season, no Child came. She continued in that
' Condition twenty Years, still feeling the Child within
' her. From that time she felt not any motion it had.
' In June 1708. she died, and the next day was opened.
' In her Belly, without the Womb, a dead Child was
' found lapt up in the *Omentum*: It weigh'd Eight pounds;
' and altho' it was kept in that hot Season three Days
' out of the Mothers Belly, it did not stink. Mr. Blegny
was curious to Inspect, and give a particular Account
of this wonderful thing to the World, not only in the
Tract above-mentioned, but also in the first Volume of
his *Zodiacus Medicus*, Obs. 9^a with very remarkable,
and learned Animadversions.

Before either of these appeared in France,
there happen'd one in Holland to H. Rhoonhuys ' A
' Woman with Child, at her full time, was four Days
' in Labour, and although she had so many Midwives,
' could not be Deliver'd. Our Author was called, December 1658. found the *Internum Uteri Osculum* close
' shut: Without Flowings, or other Fore-runners of
' Delivery. He finding the common Passage so closely
' shut up, and a very painful Tumour above the Navel,
' pre-

proposed the *Cæsarean* Section. The Woman having seen that dreadful Operation made at *Paris*, earnestly desired him to perform it on her. But he, to observe some unnecessary Forms, delay'd it 'till the Woman was past Life: Who he believes might with the Child have been preserved, if the Operation had been done when he first saw her.

Opening the Belly after death, he found a Child amidst the Intrals; and, as he saith, the *Placenta* fastned to the *Colon*, and part to the *Fundus Uteri*; and that there was a Breach in the Womb capacious enough for the Infant to pass thorough it into the Belly; and that Wound he thinks was made by a blow, altho' it hurt not the external Parts, nor made Impressions on the tender *Embryo*. I can't approve, nor will I censure the many things in his Report liable to exception, and which Criticks will be apt to think absurd. I presume to believe he mistook the extended Tube for a *Matrix*, as *Vesal* did. *Erranti nullus terminus.*

A much more famous, and learned Man than he, (*T. Bartholinus*;) did the Year after *Rhoonbuijs's* Exploration, meet such an extraneous *Fætus* lapt up in a *Mola*, which he found in the Belly of a Woman; and thus conjectures—*Non possum aliud divinare, quam quod fætus hic primo fuerit in lubis uteri conceptus.* He imparted this Story first to *G. Horstius*, Ep. 58. Vol. 4. Afterward to the whole World, in the 92^d Observation of his *sixth* Century.

A. D. 1662. In the City of *Aurange*, *D. Baldwin*, and *Mr. De la fort* found—*Puellum Egregium, optime formatum extra uterum.* The report of this Discovery is made publick by the famous *Sachs*, with very learned Remarks. *Miscell. Cur. Vol. 1. Obs 110.* which he concludes

cludes (as I shall) with one more stupendous than all I have cited, which he had from the *Silesia* Chronicle, written long since by *N. Polinus*, and thus relates it. ‘ *A. D.* ‘ 1581. ‘ A Woman that had born Ten Children in ‘ Fifteen Years Matrimony, conceiv’d again, and at the ‘ full time was deliver’d through an Abscess of the left ‘ *Hypochondria*. — *Ex qua infans boni habitus extractus; qui* ‘ *Baptizatus fuit. Et annum unum cum demidio supervixit;* ‘ *Mater vero, summs in doloribus tertio die obiit.*

Sir, I humbly beg your Opinion of these Reports, and my Notions; that if I am skilful or lucky enough to meet your Concurrence and Approbation, I may accordingly value my self, or be better informed.

Plimouth, August 16.

1709.

James Yonge.

V. *An Extract of an other Letter from Mr. James Yonge, upon the same subjects as the former.*

Honoured Sir,

THE Anomalar Blackness of the Girl's Face, of which I sent the History, is now divided into a few dark, cloudy Specks; which appear but seldom, and nothing so livid as formerly.

I am told by a Gentleman Hunter, that he lately found in the Paunch of an Hare, two full grown young Ones among the Bowels; but almost rotten: And three *Immature Embryo's* in the *Uterus*. The former were certainly *Fetus* broke out of the Womb, &c.

Plimouth, Nov. 1.
1709.

Most Worthy Sir,

Yours, &c.

James Yonge.

VI. *An Account of three Cases of the Hydrophobia.* By R. Mead, M. D. F. R. S.

THE Symptoms from the Bite of a mad Dog are so surprizing and terrible, that it is hardly possible to describe the Agony of a Patient in this unhappy Condition. I have lately had the opportunity to see two Instances of this Case.

The first was of a Lad of about the Age of Nine Years, a sturdy and bold Boy. A mad Bitch of the Mangrel kind was hunted in the Street, he struck at her with a Stick, and she flying in his Face, bit him in the right Cheek, which was torn with a large Wound to the middle of the Nose. This was on the 20th of April last. A Surgeon cured the Wound in about 14 days time, by applying for the first three Days, *Theriac. Andromach.* in *Sp. Vin.* and afterwards dressing it with *Liniment. Arcei* and *Balsam. Terebinthin.* No other Care was taken, only a *Bolus* of *Theriac. Andromach.* was given him every Night while under Cure, and quickly after he was bit, he was persuaded to eat the whole Liver of the Bitch fry'd.

He continued very brisk and well to the 22d of May; upon that day he seem'd dull and Sick, would eat no Dinner, except a little boil'd Spinnage, walk'd out in the Afternoon, and in the Evening complain'd of his Stomach and Head; his Mother gve him a small Glass of Brandy, for he would drink nothing else. In the Night he was very

T t t bad,

bad, startled often, and screamed out as in an Agony, especially when desired to drink, and complained miserably whenever he made Urine, saying it hurt him. The next Morning he vomited up the Herbs he had eat the day before, unalter'd. I was sent for that Day in the Afternoon, and found him in a perfect Agony, all in a sweat, trembling, tossing himself up and down, talking continually, looking very wild; his Pulse low, and sometimes quicker, then slower: His Urine made the Night before as well Colour'd as ordinary. I desired him to Drink; he took a little in his Mouth, but as it was going down, he threw it out with Violence, saying it hurt him; and praying that he might take no more. We over perswaded him to hold a little in his Mouth and swallow it by degrees and gently; he did so with a little more ease, but was glad when 'twas over. We bid him suck the Drink thro' a Quill; he try'd, but could not get it down by continual Gulps, but stopt as soon as a very little was paid, still crying out that it hurt him to swallow it.

I presently declared the Case to be desperate. However for the satisfaction of the Relations, Blistering-Plasters were apply'd to the Back and on each side of the Neck; and a Diuretic *Bolus* of *Sal. Succin. Camphor. and Conserv. Lujul.* was given every six Hours; for he seemed from the first of his Complaint to have a difficulty of Urine.

The next day, the 24th at Noon, I found him much worse, he had raved all Night; could not bear the sight of any thing white, and said, that if all the Women in the Room who had white Aprons would go out, he should be well presently. He said he would drink if we would give him it in a black Cup; but when brought made many Excuses and could not, tho' at the same time complain'd he was dry, and pleased himself with talking of full Pots. He eat some Bread and Butter heartily, but vomited it up quickly together with a frothy Slime. We dippd

dipp'd him in a Tub of warm Water ; he said he was not afraid of Water, and was quiet in it for a little while, but soon fell into a Convulsion Fit, which obliged us to take him out. I observed his Eyes to grow more staring, and the Pupil to be prodigiously enlarged. He was thrown continually with such Violence from Place to Place, that it was very hard to keep him in Bed ; and quite tired and spent, fell into cold Sweats, and dy'd this day at Four in the Afternoon.

The next day I obtain'd leave to open the Body. We examin'd the Brain, Throat, Breast, and Stomach, but met with no extraordinary appearance any where, excepting that there was a great quantity of greenish viscid Bile in the Stomach.

The other Patient was a very lusty vigorous Man of 45 Years. He had ten Weeks before been bit in one of the Fore-fingers near the Nail, by a little Naked Dog of the Guinea Breed. On the 8th of November in the Morning he complained of a great Sickness at Stomach, and vomited green and yellow Choler. The next Morning he took a Dose of *Rad. Ipocacuanh.* Whilst he was vomiting, he complained of a difficulty of swallowing ; and when press'd to drink to work off the Medicine, contrived himself a way of sucking the Gruel given him, through a piece of a Tobacco Pipe, but could not get down a over one Pint ; and tho' he afterwards often try'd this Trick, yet it did not succeed.

On the 10th he had eight Ounces of Blood taken away at the Arm, and took a *Bolus* of *Theriac. Andromach.* with *Lap. Contrayerv.*

I came to him on the 11th ; found him ty'd in his Bed, raving Mad, biting and spitting at the By-standers, crying out Murder, making an odd Noise as if he cough'd up something from the Throat ; this motion I had also

took notice of in the Boy, and I suppose this is what some Authors have call'd *Barking*.

He say'd he would drink if we would unbind him, and give him Water; but as soon as it came to his Mouth, he threw away the Cup with the greatest Fury imaginable, and grew so unruly, that he was with much ado ty'd down again.

I observed that he had a Palfie of his right Arm, for he moved this only by the Help of the other; and those who attended him, had taken notice of this Symptome began the Day before, and that at the same time he had endeavour'd to Read, but could not, complaining of a Mist before his Eyes.

As he seem'd afraid of every body, so he shewed the greatest Enmity to those, for whom at other times he used to have the most Love and Respect.

I ordered a Surgeon to take away 20 Ounces of Blood at his Arm: And observed it to be very thick and black. He was very tame after this for a few Minutes, but fell again into his outrageous Fit, in which he soon laid himself down quite spent, and dy'd.

I could not by all possible means get leave to open the Body.

Since these Accidents I have had an Account sent me by a Surgeon from *Stamford* in *Lincolnshire*, of a young Man of about 18 Years, who dy'd *Hydrophobus* by the Bite of a Mad Fox, that had been bit by a mad Dog. The Symptoms discovered themselves three Months after the Wound, which was upon the back of the Hand, and being healed by the Application of *Theriaca Andromach.* had left a small black Scab behind.

Three days before his Death he was seized with a Fever, for which he was Blooded, Vomited and Blistered; he bit to pieces the Glass in which Drink was given him.
When

When Dissected, the *Fauces* were found very much inflamed; The left Lobe of the Lungs black, with the Vessels full of black Blood; The surface in some places, which the blackness had not cover'd, appearing Ulcered, as it is said by *Caulharides*. The Liver was hard and of a yellow bilious Colour.

During the whole Violence of the Distemper, the *Penis* was observed to be continually erect, and as hard as a Bone. This Symptom is particularly taken notice of by *Celins Aethelmanns*.

The Surgeon who opened the Belly, with his Knife slightly wounded his Fore-finger, and was surpriz'd to find that it festered, and gave him much more Pain than a greater Cut had at other times done. This I the rather take notice of, because something of the same nature happen'd to the Surgeon who Dissected my Patient. His Hand the following Night was taken with an *Erysipelas*, attended with great Tension and Pain: This was owing to a little Wound made in one of his Fingers a Day or two before, from which, in turning over the Parts, he had rubb'd off the Flaster; and it went not off without the continued Application of Cooling and Discutient Medicines.

From all these Histories, it may not perhaps be wrong to conclude, that the *Hydrophobia*, (a Name not very proper for the Distemper) is the Effect of a particular kind of an Inflammation in the Blood, accompany'd with so great a Tension and Dryness of the Nervous Membranes, and such an Elasticity and Force of the Fluid with which they are filled, that the most common Representations are made to the Mind with too great Effect, and the usual Impressions of Objects upon the Organs cannot be suffered: Hence proceed the Timorousness, unaccountable Anxiety and Inquietude, which are always the forerunners of the Dread of Liquids; as also did the Pain

Vid. Essay on Poisons.

Pain in making Water, and the strange Aversion observed in the Boy at the sight of any thing *White*; the *Retina* being really hurt and grieved by the striking of the Rays of Light upon it. Nor is it hard to conceive that when the *Salival* Liquor is not, and the Throat inflam'd and dry, the swallowing of Drink should cause such an intolerable Agony; no more than it is that, when things are wrought up to this wretched Condition. the dismal Tragedy should not last above three or four days at most, in which the Patient is perfectly fatigued and torn to Death by the Violence of his Actions and Efforts.

Vth *An Account of an Experiment, touching an Attempt to produce Light on the Inside of a Globe-Glass lin'd with melted Flowers of Sulphur, as in the Experiments of Sealing-Wax and Pitch. By Mr. Fr. Hauksbee, F. R. S.*

Notwithstanding Sealing-wax and Pitch afford such surprizing Phænomena, rendring the Form of Bodies visible thro' their Opake Substances, under the Circumstances of a Vacuum and Attrition; yet there are other Bodies, by which very different Effects will be produc'd; of which I shall give you a very remarkable Example: And that is in Flowers of Sulphur, or Sulphur Sublim'd. About half a Pound of this Preparation I melted in a Ladle, and pour'd it into a Globe Glass, and used it in all respects as in the other Experiments: And when it was exhausted, and Motion and Attrition given, I expected as before to have seen a Light on its inside: But all that we could do had no manner of effect on it, in relation to such an Appearance, neither when it was exhausted, nor when replete with Air: There was nothing to be observ'd but a very small weak Light, which after long rubbing shew'd it self in that part where the Hand touch'd the Glass. But when I came to look upon it, I found the Sulphurous Lining all in a body disengag'd from the Concave surface of the Glass. As to the Electricity of the Globe lin'd with this sort of Matter; after the Attrition of it had been continued for some time,

and

and the Glass was become pretty warm (at the same time and of common Air) the Hoop of Threads was held over it; but the Attraction was very inconsiderable on the hind part, though on the transparent side the Threads were more vigorously directed; yet not with that force and Acuteness, as when the Glass is perfectly clear within, as this was not; because the Fumes of the melted Sulphur adhering to it, made it appear somewhat Cloudy.

A Repetition of the foregoing Experiment with Common Sulphur.

I took a quantity of Common Sulphur, nearly equal to what I had used before of the Flowers; which having melted as before, I pour'd it into another Globe-Glass, which I us'd in all Respects as the former. But when I had exhausted it, and given the usual Motion and Attrition, the effect was so surprizingly different, that one would scarce think it should proceed from the same sort of body. For the Figure of my Hand and Fingers appear'd not only on its inside, (tho' more faint and pale than in the Experiments of Sealing-wax and Pitch,) but on its outside there appear'd a brisk Purple Light, so beautiful and agreeable to the Eye, that it was very pleasant to behold. The Strength of this Light may be judged from hence, That the Lines of the Palm of my Hand, which being near the touching Parts, were easily discoverable by it; and were a small Print plac'd at the same distance, I question not but it would be legible without any great difficulty. And as this common Sulphur differ'd vastly in that part of the Experiment already related, from the former, so likewise in the latter; for when the Hoop of Threads came to be held over it, (under the same Circumstances as in the other) they were directed toward it as vigorously as in any Experiment heretofore made. The Parts liv'd and trans-

transparent perform'd much alike; if there was any difference, it seem'd to incline to that part lin'd with the Sulphur. Likewise in this Experiment as in the last, the Sulphur was loosen'd and separated from the Glass that contain'd it: Which therefore cannot be urg'd, as any ways conducive to the Unsuccessfulness of the former.

A Repetition of this last Experiment with a larger quantity of Sulphur.

Into a Globe Glass of the same size of the former, which was about five Inches Diameter, I pour'd about two Pound of melted Sulphur: This, when cold, contracted it self, and became loose from every part of the Glass, as in the former Experiments: The Sulphur cover'd more than half the inward surface of the Globe, and its thinnest part was about half an Inch in thickness. Towards the Axis it appear'd to be more than a full Inch in Substance. This Glass, when exhausted of its Air, was used in every thing as the former. The Light produc'd was very considerable, I mean that on its outside, and attended with the same Colour and Vivacity as before; nor was that less vigorous on its inside. Comparing it with the former, notwithstanding the thickness of the Lining, it was at least four times greater; but the Figure of the Fingers was now not so distinguishible as in the other. But on the part near the Axis (as I hinted before) where the substance of the Sulphur was much the greatest, no Light was produc'd; which may be attributed in a great measure to the slowness of the motion and the weakness of it there, in comparison with that which is made more remote from it, where it was that the Light was seen within. What farther is observable, was that the Light which was visible on its outside only, appear'd to be

U u u

produc'd

produc'd between the inward Surface of the Glafs and the convex Surface of the Sulphur; the Sulphur being loose from it gave liberty for the Air to be taken from thence as well as from the other Parts: The Light which was there produc'd, being reflected by the hard, polish'd, and nearly contiguous Body of Sulphur, seems to me to be the Reason why it appear'd with so much vigour. This outward Light would sometimes break into Branches all over the lin'd part of the Globe, in as odd, and as pleasant a manner, as what has been taken notice of in former Experiments, with the large Globe Glafs, upon letting in a little Air. And what farther occur'd in this Experiment was, that when the Attrition was ceas'd, but the Globe continuing its motion, abundance of Sparks of Light would appear all round it, and continue so to do for some time, without any fresh Attrition. I cannot conclude without taking some notice, that in the Experiments formerly made on Sulphur, mention'd in my Book of *Physico Mechanical Experiments*, I us'd the same sort as in the first of these; and had it been my Chance to have happen'd on the common sort, I doubt not but the Success of it would have been different from what is there related, which I hope to try at one time or other.

Coroll. Hence we may see what Remarkable Changes may be produc'd in Bodies, with respect to their *Electrical* and *Luminous* Qualities, by their different Management and Preparation: As here 'tis plain that common Sulphur, which is plentifully endow'd with both these Qualities, by undergoing the *Chimical* Fire (which *sublimes* it into *Flowers*,) is almost totally depriv'd of them both.

Perhaps by *other* management of the same Body, this Loss might be repair'd again. And 'tis possible there may be *Chymical* Operations, which instead of impairing, may *Improve* and Heighten these wonderful Qualities of Bodies: Nay for ought that I know, may as well *give them a new*, where they never were at all; as to take them away, where they once were in a great degree of Perfection. The Powers of Nature are not to be determin'd beforehand by *Demonstration*, but to be search'd out by *Observation* and *Experiment*. And as these Trials have open'd the way to *something that looks with a very promising Aspect*; so we hope by degrees to pursue them with some good Success.

VIII. *A Letter from Mr. Anth. Van Leeuwenhoek, F. R. S. Containing some Microscopical Observations on the Particles of Crystalliz'd Sugar, &c. and his manner of Observing the Circulation of the Blood in an Eel.*

I Send you herewith my last Remarks, concerning the Coagulation of Sugar, which I had traced upon Paper near Three Years ago, and caused them to be Engrav'd upon a Copper-Plate, after that my Painter had Drawn them; and for as much as some of these following Observations do contradict my former Writings, I make no scruple to reject the past, and to take up these which I judge to be better.

I have said that the Particles of Sugar, which we call Sugar-Candy, consisted of two broad and two narrow sides; and that the other, *i. e.* the top and bottom ran into a sharp point, like the Figure of a Wedge or Chissel.

Since there is not one Man in a Thousand that knows any thing of the Figures which Sugar-Candy assumes in it's Coagulation, altho' they've often tasted of the same, I have thought it not amiss to represent it to the Eye. Fig. 1. A, B, C, D, E, F, G, H, I, K. represents a small bit of Sugar-Candy, of which one shall seldom see so perfect a Figure; because they are almost always fasten'd to some other Particles of Sugar, whereby we can only discover the Superficies of one side thereof, as here in this Figure H. I. E. F. G. but when it is taken out of the Syrup.

syrup or Liquor, without being united to any other Particles, the other side represented by A. B. C. D. K. will also appear after the same manner.

We also observe that all the Particles of the Sugar Candy which we buy, even that which comes out of the *East-Indies*, if it be not too irregularly Coagulated, and fasten'd to the sides of other Particles, has generally one side blunt, and different from the other three, which have sharp Angles, just like a square piece of Wood, one of the Corners of which is partly cut away, as you may see in the said Figure 1. at I. K.

Fig. 2. L. M. N. O. P. Q. does also represent a little Particle of Sugar Candy, which had been joined to others at the side L. M. N. and at O. there appears a very small Particle of the Candy that seems to have been Coagulated with the said *Fig. 2.* when it was much smaller; and that Particle appear'd like Mountain-Chrystal, and under that there was another composed of about ten small Chrystals:

For my farther Satisfaction concerning Sugar Candy and the Coagulation thereof in the Syrup, I took some Powder'd Sugar, and dissolved it in Water, and then boyled it so long, 'till I supposed all the Water to be evaporated; after which I placed it upon several Glasses, to the end that I might observe the Coagulation of the small Particles thereof.

After some days were past (this was in the Month of *March*) I observed a great many compleat Figures, which lay Coagulated into several Shapes, but all of 'em as clear and transparent as Chrystal, insomuch that it was a great Pleasure to view them; but I did expect to have found them all of one and the same shape, and that they would have appeared like *Figure 1.* but when I view'd them with a Microscope, some of them appeared like *Fig. 3.* R. S. T. V.

This

This appear'd to me at first something strange; but when I considered that the Particles of Sugar (of which some of them are a great many Thousand times smaller, yea so small, that they escape the sight thro' a Microscope) do not appear to the Eye in the same position, nor that the Wedges thereof are represented as in *Fig. 1.* by B. C. or G. F. but that on the contrary, the side which is described in the said Figure, by C. D. E. F. I. K. lies sometime upper, or undermost; then it is no wonder if the same Particle of Sugar Candy shall appear to the Eye as in *Fig. 4.* A. B. C. D. E. F.

In that Particle of Sugar beforemention'd, I observed several Streaks or Fibres that were internal, and which by reason of the Transparency of the Sugar appear'd plainly to the Eye, as you may see in the said *Fig. 4.* between D and C. and D. and E. and so also from the Center of the Sugar where those Streaks extended on each side to B and F.

From this Observation I concluded, that the Sugar increased from time to time, in proportion to the spaces between each Streak or Fibre.

I likewise saw a few coagulated Sugar Particles, that appear'd in as compleat quadrilateral Figures as I ever beheld with my Eyes, one of which you have describ'd by *Fig. 5.* G. H. I. K. and withal as clear and transparent as any Diamond; you must also observe that these *Figures 3, 4, 5.* were none of 'em bigger than a small Grain of Sand. The reason why there were so many Particles of Sugar, that had but one part of *Fig. 3.* was, as I suppose, that they were Coagulated with others that lay near them of the like figure, insomuch that they hinder'd one another in their Coagulation; but when they lye so far from one another, that there is no actual Contact of the Parts, and yet are Coagulated, we can attribute that effect to nothing else but a secret *Inclination* which the invisible Parts of the Sugar bear to each other.

In

In the middle of the *Fig. 3* and *5*. we observed a very clear Particle, which was of the same Figure with the whole Body; from whence we conclude, that the said whole Body was much smaller at its Coagulation, but increas'd continually by new Accessions of Matter round about it; and that in proportion to the number of Circles or Circumferences, the Body increas'd from time to time in bigness: And who knows but that every Circle was made upon a particular Day, and in dry Weather, and that at Night it remained in the same State.

These little Figures preserved their compicat Forms and chrySTALLINE Appearances as long as it was dry Weather; but when it happen'd to be Moist or Rainy, we observed Moisture about the Particles of the Sugar, which in dry Weather evaporated again; and then there Coagulated an infinite number of small Sugar Particles upon the greater, and those were so exceeding small, that a thousand of 'em together were not so big as one of those Particles before described by *Fig. 3*. which, as I said above, was not so large as a single Grain of Sand, and thereby all the Beautiffulness of them disappear'd: And to the end that those little Figures might keep their form 'till they were drawn, I was forced to carry both them and the Microscope, before which they stood, in my Pocket.

Now since we see that from one and the same Matter two different Figures are Coagulated, it is easie to conceive that several other Figures might be produc'd in the first Coagulation, especially when any of the Parts of those little Bodies lye upon one another; and therefore also we shou'd not wonder, to see in the Coagulation of Salts several Figures produced out of one Particle of Salt.

I can't omit acquainting you upon this occasion, that some body sent me last Summer a Piece of Mineral, which was said to be very rich with Gold, and was brought from *Hungary*; and I was desir'd to enquire into the substance of the said Mineral; which when I had done, I found.

found that the fine Gold Colour was nothing else but Sulphur: There was also another Piece, which they said was Copper. One of these Minerals was mix'd with a little stony Matter, just like Particles of Sand, which seem'd by some heterogencous Matter, to be united to the other Parts of the Mineral.

I separated some of the Stony Matter from the rest, and placed it before the Microscope; and found that some of the Particles, of which it is composed, had as smooth and exact Sides and Angles as any polish'd Diamond can have, that is to say, when they were not united, or lay under others; but where there was a union of the Parts, there appear'd several such Circles or Circumferences as were in *Figure 3* and *5*. some of 'em having particular sides, one of which was twice as broad as another.

These particular Rings or Circles I judg'd also were occasion'd by the Increase or Coagulation of new Matter: I took a great deal of Pleasure in viewing them, for they appear'd as clear as Chrysal. Both the Gold and the Copper, that seem'd to be in these Minerals, were nothing else but Sulphur.

My Intention was to have left off here, but upon second Thoughts I shall trouble you with what follows. I formerly shew'd the Circulation of the Blood in an Eel, and my Custom was to put the Eel into a long Glass Tube with the Tail uppermost: But I have left off that way for some Years, and now I prepare Copper Plates of about a Foot long and seven Inches broad; one end of which of the extent of an Inch I bend, and at the other end I make a square Hole of five Inches long and two broad, in which I put little Glass Plates as clear and as thin as I can possibly procure them: Upon such a Glass Plate I lay one of the smallest Eels I can get, which are sometimes as big as ones Finger; then I bind the Head and the best part of the Body of the Eel about with a Linnen Cloth, to the
end

end that it may not see, and then 'twill lye the stiller upon the Copper-Plate ; and the Tail is laid upon the Glass, and that part of the Body of the Eel, that is wound about with the Cloth, is also fasten'd to the Plate with a Wire. that the Eel may not riggle it self off.

The Eel being thus placed upon one side of the Glass in the Copper Plate, The Microscope, through which you are to view the Circulation, is fasten'd by Wires and Screws on the other side, in such manner as it may be moved upwards and downwards, and every way. And this I take to be a better Method concerning the Circulation of the Blood than my former ; which if People wou'd therefore use, I doubt not but they might observe the same Things in an Eel as I have done : And then if you wou'd view the Arm, and with great Care consider the Pulse in the Veins, you wou'd certainly discover that the Blood, which makes the Pulse, proceeds from the Hand. I conclude, and am,

Yours, &c.

Antony van Leeuwenhock.

IX. *Part of a Letter from Mr. B. Sherman to Dr. Hans Sloane, R. S. Sec. concerning the Bones of a dead Fœtus, taken out of the Uterus of a Cow; and of a Callus that supplied the Loss of Part of the Os Femoris.*

S I R,

YOU will receive with this a Curiosity which I thought might not be unacceptable to you; 'tis the Bones of a Calf that perished in the *Uterus* of its Dam after the following manner, as I had the Account from the Person who sold the Cow to the Butcher.

The Cow was very unthrifty, for which they gave her Cow Phylick, and such Drinks as they apprehended proper for her; notwithstanding which she grew worse, and continued a great while in a lean, pining, wasting Condition, and was reduc'd to so weak a State, that they concluded she would dye; when on a sudden she began to eat her Meat, and did thrive so very fast, that in Six or Eight Months she was so fat as to be Sold to the Butcher; who, when he kill'd her, found these Bones in her *Uterus*, just as you will see them in the Box, full as dry

dry, there being no manner of Moisture in the Bag (as he call'd it) in which the Bones were contain'd. The same Digestive Humour, which dissolv'd the Skin and Muscular Parts of the Calf, might (I presume) reasonably enough be suppos'd to dissolve the Cartilages, and (for ought I know) even part of the Bones in a *Fœtus*. I am pretty sure what I send you is all the Butcher found, and I believe you will find them compleat; but of what Age the *Fœtus* was, or whether, if the Cow had not been kill'd, there would have been a total Dissolution, I must leave to your more curious Judgment to determine.

I am inform'd by some Physicians to whom I have shewn these Bones, that there are many such Instances in Anatomical Writers; and particularly one of a Woman, whose *Fœtus* dissolv'd so perfectly, that some of the Bones digested through her *Abdomen*, and (which I think is more strange) that the same Woman had Children afterwards.

Whether these Bones would in time have made their way through the *Abdomen* of the Cow, I am not able to judge; all I can assure you is, That these Bones were found as is above express'd, and that the Fact may be proved by Witnesses of undoubted Credit.

P O S T S C R I P T.

I Could not omit to subjoyn an Observation in my own Practice, which also may not be unworthy your Observation; 'Tis of a Compound Fracture, which happen'd on the Thigh of a Young Man about Seventeen

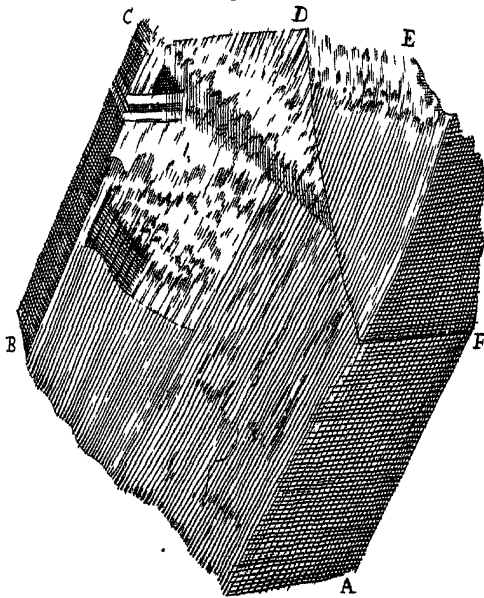
venteen : I was oblig'd to take out the whole Substance of *Os femoris* about Two Inches; and yet, by keeping a due Extension, Nature did in four Months supply such a *Callus*, that the Part is not a quarter of an Inch shorter than the other side; and the Person is as strong as ever, and walks without any Lameness.

Keldon near Witham in Essex,
September 4. 1708.

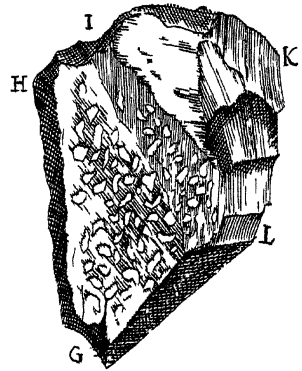
Yours, &c.

B. Sherman.

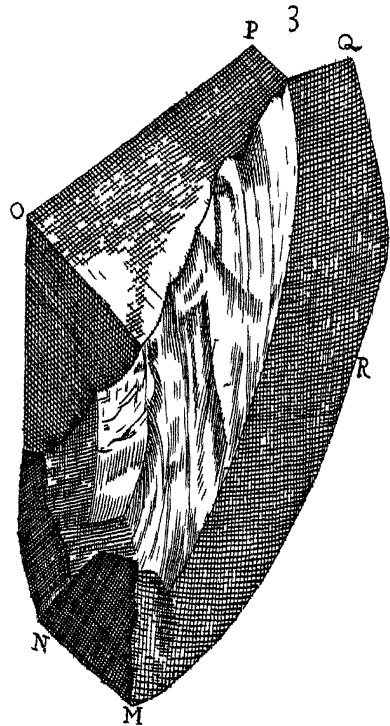
Fig 1



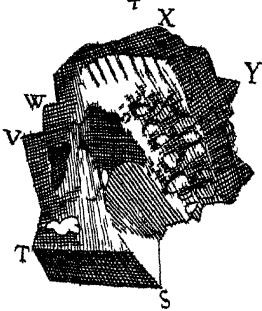
2



3



4



PHILOSOPHICAL TRANSACTIONS.

For the Months of November and December 1709.

The CONTENTS.

- I. **T**HE History of the Great Frost in the last Winter 1708 and 1708-9. By the Reverend Mr. W. Derham, Rector of Upminster, F. R. S.
- II. Microscopical Observations upon the Configuration of Diamonds: In a Letter from Mr. Antony Van Leeuwenhoek, F. R. S.
- III. Part of a Letter from the Reverend Mr. W. Derham, F. R. S. to Dr. Hans Sloane, R. S. Sec. Giving an Account of a Child's Crying in the Womb.
- IV. A short Dissertation concerning the Child's Crying in the Womb. By the Reverend Mr. W. Derham, F. R. S.
- V. A Letter from Mr. Antony Van Leeuwenhoek, F. R. S. to John Chamberlayne, Esq; F. R. S. Containing his Observations upon the Edge of Razors, &c.
- VI. A Second Letter from Mr. Antony Van Leeuwenhoek, F. R. S. to John Chamberlayne, Esq; F. R. S. upon the same Subject as the former.

I. *The History of the Great Frost in the last Winter 1703 and 1704. By the Reverend Mr. W. Derham, Rector of Upminster, H. R. S.*

THIS Famous Society having done me the Honour to put into my Hands their Papers relating to the late *Great Frost*, and having also my self received divers Relations thereof from my Friends at Home and Abroad, as well as made Observations my self, I shall endeavour to give an Account of Two Things ; *The Degree, and Effects of this Remarkable Frost.*

The Degree of the Frost in England.

As to this Matter, I believe this Frost was greater (if not more universal also) than any other within the Memory of Man. The greatest that hath happen'd within our Memory, was the *Long Frost* in 1683 ; but the late Frost, although of shorter continuance, was more intense than that. Of which I have already given some Account in a former Paper (which I find in the *Transactions*, No. 321.) and must be forced to Recapitulate it here; viz. That my Thermometer was much lower on December 30. than it had ever been since 1697. when I first began my Thermometrical Observations ; That the self-same Thermometer in our Repository in Gresham-College was lower than ever it was before : [The Particulars of its greatest Descents are these; January 26. 1696. 41 Gr. January 5. 1683. 40 Gr. and January 3. 1703. 43 Gr.] And lastly, that in another self-same Glass in
London

London [Mr. J. Patrick's] the Spirits were four or five degrees lower than in 1683.

In *London* the greatest Contraction of the Spirits was on *January 3.* which was an excessive cold Day at *Upminster* also: But the far greatest Contraction with us was on *December 30.* before. The reason of the Difference is, because my Thermometer is always abroad in the open Air, where no Sun-shine toucheth; but those two *London-Glasses* are within Doors, in Rooms where no Fires are made. And it is easie to observe, that the Frost doth not presently exert its greatest force with in Doors: And when it doth, neither doth it so soon abate its force within Doors, as without. The reason whereof is plain enough, and needs not be mention'd.

These Observations of the Intenseness of the Cold with us, I have received Confirmations of from other Places in the Southern Parts of our Island; particularly I find them to agree with some Observations made at *Sireatham* in *Surrey* by Mr. *Cressener*, an Ingenious Member of our Society.

I had like to have forgotten to Note, That the Descent of the Spirits in my Thermometer on *December 30.* was within One tenth of an Inch as great as the Descent effected at another time (and that in a cold Day too) with Artificial Freezings perform'd both with Snow and Salt, and also Snow and Spirits. Both which Mixtures I have several times made use of, and find them nearly of equal Power: If any difference be, I have sometimes thought the preference due to the Mixture of Spirit of Wine with the Snow. I said also the Contraction of the Spirits in a cold Day, because an Artificial Freezing is less vigorous in a warm Day than in a cold one. It is well known that we can in Summer freeze with Ice and Salt, and the same may be then done with *Sal Armoniack* dissolv'd in Water; but we cannot produce so intense a Frost

then by these means, as in Winter, and especially in a very cold Day. But these Things by the by.

The Degree of the Frost in Scotland and Ireland.

But notwithstanding the Frost was so extremely rigorous in the Southern Parts of our Isle, yet the Northern felt little thereof; as I have been certified by Persons that have come from thence, as well as by several Letters my Friends have received from thence. My Ingenious and Learned Friend Dr. *Sloane* writes to me in general, That he hath received many Informations from those Parts, which do all agree that the Winter was no way extremely Cold there, but as other Winters. And as to Particulars, the two following Letters from two eminent Persons in those Parts, to my Ingenious and Learned Friend Dr. *Woodward*, will give an Account. One is from the Right Reverend and very Learned Lord Bishop of *Carlisle*, dated from *Rose*, November 5. 1789. “ In January last “ (saith he) I had a sufficient occasion to take notice of “ the Frost and Colds being more intense in the Southern “ Parts than here, and the Snow much thicker. I began my *London*-Journey on the 26th of that Month, “ three days before the Thaw, and can assure you that “ for several Miles (near the Banks of the River *Eden*, “ in both the Counties of *Cumberland* and *Westmorland*) “ my Horses hardly ever trod upon Snow. When we “ came to *Stancmoor*, on the Confines of *Yorkshire*, we “ found the Ground covered pretty thick, and the deeper still the farther we came to the South. None of our “ Rivers or Lakes were frozen over; and the extraordinary Flocks of Swans that resorted hither (nothing of “ the like having been seen by the eldest Man living) was “ a sure Argument that the Temperature of Climates “ was strangely inverted. Thus fir that Right Reverend Member of this Illustrious Society.

The

The other Letter is from *Edenburgh*, November 5. 1709. from a very Curious and Ingenious Person, Sir Robert Sibbald; who saith, " I can learn no extraordinary Effects of the cold Season here. It was a long Winter : " The Cold came early in *October*, and continued till " near *May*. There was much Snow, which lay long " upon our South Hills near this Place. We had not " much Frost to speak of, and it lasted not long. There " was but little Sport at *Curling* upon the Ice [A Sport in *Scotland*, usual in hard Frosts, when the Ice can bear a great Company of People.]

And as in *Scotland*, so in *Ireland* the Frost was very favourable: Of which among other things, I have this Account in a Letter from *Dublin*, from Mr. S. Molyneux, a very curious and ingenious Gentleman there; who saith, " They had there an harder Winter than usual, but judg- " eth they suffered not so much as their Neighbours: " They had two or three pretty hard Frosts, and some " Snow, but not of any remarkable continuance, as he re- " members.

The Degree of the Frost in other Parts of Europe.

Having thus related how the Case was near Home, let us next look farther Abroad, and first into the more *Southerly Parts of Europe*.

And in the Comparison I have already given the Society between Dr. *Schenckzer's* Observations at *Zurich* and mine here, I said, That he noted the Cold to have been excessive there; but whether more than usual, he saith not. But by a Letter I have lately seen from his Brother (of which more by and by) it appears to have been in as great and unusual Excess there, as here it was with us.

In that Paper also I have forestall'd my self, and said to what Excess the Frost arrived in *Italy*, viz. " That the Cold there was so great, that for 20 Years past they had not been sensible of greater, and on *Twelfth-Day* it wanted but half a Degree of the Extremity.

As to the *Northern Parts*, the before commended Dr. Woodward tells me, that in a Letter he received from the Learned Mr. Otho Sperling, from *Copenhagen* dated April 6. 1709. he calleth it *Hymus Atrocissima*. And I find it noted in the Minutes of the *Royal Society* of May 4. 1709. " That Dr. Judichar said the Ice was frozen in the Harbour of *Copenhagen* 27 Inches; and that April 9. N. S. People had gone over between *Schone* and *Denmark* on the Ice. Which Accounts give me a better Opinion of some Papers I have by me, which were shew'd to the Society, concerning the Frost at *Copenhagen*, pretended to be taken from the Observations of Mr. Romer. I should not entertain any the least distrust of the Accuracy either of the Instruments, or Observations of that Eminent Person, were I sure they were his. But there are some Passages and Hints in those Papers that lessened others, as well as my Opinion about them. 'Tis said there, " That such a Frost hath not been known in the Memory of Man in these Countries, and that the Frost on *January* 7. and *February* 23. 1708. did very nearly approach the Point of Artificial Freezing.

In the *Northern Parts* of *Germany* also I find they had the same fare with their Neighbours of *Denmark*. Of which I have an Ingenious printed Account put into my Hands by the foremention'd Dr. Woodward. The Title of the Book is, *Consideratio Physico-Mathematica Hymis proxime Præterlapsæ*, &c. being an Academical Exercise performed in the University of *Hall*, *June* 13. 1709. by G. Remus a *Dantzicker*, and Printed at the same Place [*Hale Magdeburgica*.] This Dissertation relating directly

to our Subject, and being I suppose in but few Hands with us, a short Account thereof may not be unacceptable.

The Ingenious Author having complained of the Defects of Meteorology, and Meteorological Instruments, and given some Directions concerning observing the Winds, &c. tells us, he had the help of the Observations of three Eminent Persons in his Dissertation about the Winter, namely, of *Dr. Walsius*, Mathematical Professor of *Hall*; *Dr. Hamberger*, Mathematical and Natural Philosophy Professor of the University of *Jena*; and of the Reverend Mr. *Tauber*, an excellent Mathematician at *Ciza*. The Winter he distributes into five Periods. The first of which he begins at *October 19. 1708.* at which time he saith the cold Weather began with them, the Northerly Winds then blowing, and frosty Weather accompanying it. But with us at *Upminster*, it began something sooner: For all the latter end of *September* the Winds were Northerly, and an Hoar-frost on *Michaelmas*, and the following Days. After which, a great part of *October* to the 23th Day, my Register shews the Weather to have been for the most part Hoar-frosty, or Frosty, very agreeably to Mr. *Remus's* Observations. The end of this first Period he placeth on *November 1. 1708.* the same with our *October 23. O. S.* their Stile I perceive by divers Comparisons, and Hints in his Paper, being the New Style.

As to his next Period, which with its Interval takes in *November* and *December*, I find a pretty deal of Agreement between his Observations and mine, the Weather often being Warm, or Cold here, as it was there, and the Winds also not very different. Only I observe the Cold in one Place commonly to precede the other. Also the furious Wind, that he saith blew the Night before *December 13.* was not perceivable here 'till the second Day after, viz. *December* $\left\{ \begin{array}{l} 14 \text{ N. S.} \\ 3 \text{ O. S.} \end{array} \right.$ about Noon: At
 Z z z 2 which

which time it had much spent it self, and was only a brisk Easterly Wind, but no Storm.

The third Period he begins on *January 5*. Of which he saith, "*Scena subito mutabatur, & cum universæ Europæ admiratione cœpit Periodus, insolito prorsus frigore notabilis.* The very same { *January 5* } the { *Decemb. 25* } the Wind and Weather began here to change, as there he saith it did, and the Cold also to encrease. The most remarkable Depressions of the Spirits he hath put into a Table, which may be seen with mine in this following little Table, fitted to our Old Style.

Day of the Month O. S.		Degree of the Ther- mometer at Hall, at 10 ^h p. m.	Degree of the Ther- mometer at Upmin- ster, at 9 ^t p. m.
Dec.	27	84 $\frac{1}{2}$	65
	28	84 $\frac{1}{2}$	75
	29	92 $\frac{1}{2}$	58
	30	100	45
	31	Totus in-	52
Jan.	1	tra Sphæ-	63
	2	ram.	54

For the right Understanding these Observations, it is to be observed that the Scale of their Thermometer runs downwards from some Point above, down towards the Ball. But the Ball, or Bottom of the Stalk, being a certain Place that all Thermometers agree in, and every one is acquainted with, I therefore make the Degrees of the Scale of my Thermometers to begin at the Top of the

the Ball, or (which is all one) at the Bottom of the little Tube, or Salk; and so reckon upwards; every Degree being One Tenth of an *English* Inch; the *Freezing-Point* in my old Thermometer (here noted) at 82 gr. equal to 8 Inches Two Tenths from the Ball; and the most *Intense Cold* at 44 gr. But in my later Thermometers (which I now use, and are much nicer than my old one) the *Freezing-point* is at 100 gr. ten *English* Inches from the Ball, and the most *Intense Frost* near to, or just in the Ball. Which things I thought convenient to note, as being necessary for the right understanding the little Table above, and also any of my Thermometrical Observations, that shall be mentioned here or elsewhere.

It may from the foregoing Table be perceived, that the Frost kept a pretty equal Pace in both Places at its beginning. And my Notes give me reason to think it did the same the greatest part of its duration: But I cannot be very sure thereof, my old Thermometer (the only one I then had) happening to be unfortunately broken on *January 11*. For which reason I am unable to give such another Thermometrical Table of his next Period as I have done in this.

This third Period he makes to end *January* $\left\{ \begin{array}{l} 25 \text{ N. S.} \\ 14 \text{ O. S.} \end{array} \right.$ with a Westerly Wind, and a Thaw, which held for a few Days. With us the Wind was Southerly at the same time, and a Thaw accompanying it for a few Days likewise.

The fourth Period he begins *January* $\left\{ \begin{array}{l} 31 \text{ N. S.} \\ 20 \text{ O. S.} \end{array} \right.$ in which I observe there is a great Agreement between our Observations as to the Cold; and those Days on which he noteth the Westerly Winds to have been strong, it was the same here. And some Agreement also, but less, is in the Coasting and Shifting of the Winds throughout this Period.

The

The fifth and last Period he placeth between *February* $\left\{ \begin{smallmatrix} 17 \\ 6 \end{smallmatrix} \right.$ and *March* $\left\{ \begin{smallmatrix} 17 \\ 6 \end{smallmatrix} \right.$ *N. S.* In this, he saith, the cold Weather returned, and continued long: And the same it did with us. But as to the end of this Period, I find some Difference, and some Agreement between our Observations. The Snow was more with them than us; the Winds changed with us from the Easterly Points, to the Westerly and Southerly, a Day or two sooner than with them; then agreed with them; and soon after veered about to the Easterly and Northerly as it did with them. And I observe farther also, that when the Winds agreed in both Places, my Notes shew the Wind to have been of some force here.

As to the Warmth of the Weather all this time, I find a pretty deal of Agreement; only as the Wind changed two Days sooner here, so we had the mild Weather, he mentions, two Days sooner: Then it grew colder here, as he saith it did with them. And whereas he noteth

April $\left\{ \begin{smallmatrix} 13 \\ 2 \end{smallmatrix} \right.$ *N. S.* to have been the first Day on which the Spirits rose to the Point of Warmth, I found by my Thermometer (then renewed) the Day before to have been as warm as that, as also were the following Days; and each of them warmer than had been all the preceding Winter; but yet that we had divers warm Days before that time, particularly *March* 12, 13, 14, 18, 19, 28. *O. S.* were warm Days, but the rest in that Month for the most part Cold.

Our curious Author having given this Relation of the State of their Winter, takes occasion to speak next of the Barometrical Heights there. Of which he hath given us a little Table: Which I shall take a more convenient Opportunity of Communicating to this Honourable Society, together with my own and some other Observations of the same Nature, made at the same time.

The Effects of the Frost.

Having thus given the History of the Degree to which the Frost arrived in several distant Parts of Europe, I shall next shew what unusual Effects this so unusual a Frost produced; and that on *Fluids, Animals, and Vegetables.*

The Effects of the Frost on Fluids.

The Waters we may easily imagine were the first thing that felt the dire Effects of this Frost. And these were in many Places frozen to an extraordinary depth; although I hardly believe to that depth, as in the Long-Frost in 1683. Of which Frost we have a sufficient instance in our River of *Thames*; whose Waters were so frozen, that above Bridge, 'tis well known, many Booths were erected, Fires made, and Meat dress'd; and on *January 10. 1683*. I my self saw a Coach and two Horses drive over the River into *Southwark*, and back again, a great number of People accompanying it. But this last Winter the Case was ~~greatly different, according to this Account I received~~ from my Learned and Ingenious Friend *Mr. Lowthorp*; who saith, "He saw several People cross
 " the *Thames* at some distance above the Bridge: But
 " that was only towards Low-water, when the great
 " Flakes of Ice that came down, stopp'd one another
 " at the Bridge, 'till they made one continued Bed of
 " Ice from thence almost to the *Temple*. But when the
 " Flood came, the Ice broke, and was all carried with
 " the Current up the River. I was told the like happen-
 " ed between *Westminster* and *Lambeth*, a little above
 " *White-hall*.

As for other Waters, they also had their share; especially where they lay exposed to the Northerly and North Easterly Winds. Nay, the Sea-waters themselves escaped not, but were covered with Ice in many Places near the Shore, in Harbours, and where they lay calm and still. Of this I have already given a pregnant Instance in the Harbour of *Copenhagen*, and the Sea between *Denmark* and *Schonen*. And in a Letter from Dr. *Newton*, Her Majesty's Illustrious and Learned Envoy at *Florence*, he tells me, " The Sea was frozen both on the Coast of "*Genoa* and *Legorne*.

As for the Northern Parts of *Germany*, the last cited Dissertation gives this Account of its Effects on Fluids: *Aqua infra solitam profunditatem in glaciem abiit, & alii liquores congelati apparere, qui aliis extra congelationis periculum med à hyeme constituuntur. Pertinet huc Fons in quodam Silesia pago, qui cum aliàs æstate frigidus, hyeme calidus deprehendatur, hac tamen hyeme spissa satis glacie non sine omnium admiratione obductus fuit. Certè Novellæ publicæ aliquoties Thermas in glaciem conversas nuntiavit: Id quod tamen calidioribus non accidit Halæ strias fontibus salis adherentes vidimus, id quod intra sæculi ambitum non contigisse fertur. Per literas me certiores reddidit D. Breynius, in urbe patria Medicus celeberrimus, Soc. Reg. Ang. Soc. &c. ipsum mare, quousque oculorum facies etiam armata penetrare poterat, adhuc d. 8. Aprilis glacie tectum fuisse. Cum is Lixivium cineribus clavellatis ad saturitatem ferme imprægnatum aeri exposuisset, licet nunquam congelare ab hominibus, qui pluribus annis ad traxerant, assereretur, brevi tamen tempore in glaciem conversum esse expertus. Ad-dit, amicum quendam suum Tartari quoque spiritum dephlegmatum congelatum observasse. Referunt observationes Halenses Sputum ex ore vix dimissum in glaciem abiens Fluxit ter in glaciem abire, etiam illi, quibus ob celeritatem, qui feruntur, frigus aliis non infestum. Thus far D. Remus.*

These

These Effects I am apt to think the Waters felt not only in *England, Denmark, Germany, France and Italy*; but in all the *Northern World* also, excepting *Scotland, Ireland*, and probably some other Islands, or Places near the Sea; although even some of these appear from the foregoing Account to have been great Sufferers too. This Universality of the Frost, I suspect from the multitudes of divers kinds of Birds (utter Strangers to these Parts, and many of them Inhabitants of the Northern colder Countries) which were seen and killed in many Parts of *England*. In our *Essex-Marshes*, near us, we had many wild Swans, Brent-Geese, many of the rarer Gull-kind, and divers other sorts of Birds, utter Strangers to these Parts. And Mr. *Bellers*, an ingenious *Gloucestershire* Gentleman, gave Dr. *Woodward* this following Catalogue of Birds killed within four or five Miles of *Coln St. Aldwins*, or *Edwins*, in *Gloucestershire*, between the beginning of *November* and the latter end of *March 1708*, which he saith are never found there in moderate Winters.

1. *Lanius cinereus major*. The Greater Butcher-Bird, or Mattagefs: Sometimes seen in *Derbyshire*, but common in *Germany*, as Mr. *Willoughby* saith.

2. *Fringilla montana*. The Brambling.

3. *Numenius, five Arquata*. The Curlew. These Birds, though Strangers to the inland Parts, I have seen common enough on the Sea-coasts of *Essex*: And Dr. *Woodward* saith he saw them several times this last Winter at the Poulterers in *London*.

4. *Gallinu'a Erythropus major*. The Redshank, or Pool-Snipe

5. *Gallinula Hypoleucos Gesneri*. The Sand-piper.

6. *Schæniclos*. The Stint.

7. *Corvus aquaticus minor*, *sive* *Graculus Palmipes*. The Shag.
8. *Merganser*. The Goosander.
9. *Mergus cirratus longiroster*. The Dun-diver.
10. *Mergus major cirratus*. The Smew, or White Nun.
11. *Colymbus major*. The Greater Loon.
12. *Larus major*. The Greater Gull.
13. *Cygnus ferus*. The Elk, or Hooper, or Wild Swan.
14. *Brenta*. The Brent-Goose.
15. *Anas niger Aldrovandi*: Seldom seen in England, but frequent in Norway.
16. *Tadorna*. The Shel-Drake, or Burrough-Duck.
17. *Anas Fuligula prima Gesneri*. The Tufted-Duck.
18. *Anas fera fusca Gesneri*, *Penelops Veterum*. The Poker.
19. *Anas Platyrhynchos mas Aldrov.* The Golden-Eye.
20. *Anas Platyrhynchos rostro nigro & plano*. The Gadwall.

The Effects of the Frost on Animals:

In the Dissertation before cited, we are told, how Animals suffered both with them, and in other Places; " That the Fresh-water Fish were every where killed in " their Parts, and that a vast Destruction befel their " *small Birds*. Both which things he was informed hap- " pened in his own Country also at *Dantzick*. Nay " some did not, saith the Author, stick to affirm, that " they saw Birds, as they flew along, to drop down out " of the Air, their Strength failing: That the *Lusatia* " *Letters* said many Cows were frozen to Death in their " Stalls. And many Travellers on the Road, he tells us, " were

“ were some quite frozen to Death; others lost their
 “ Hands, Feet, Noses or Ears; and others fainted, and
 “ were in great Danger of Life or Limb, when brought
 “ too soon near the Fire. Of these Particulars he gives
 “ divers Instances from their News Papers; of two Gen-
 “ tlemen, and a Smith in *England*, and above 60 M.n.
 “ and many Cattle near *Paris*; and the like at *Venice*, and
 “ 80 *French* Soldiers near *Namur*, all killed on the Road,
 “ with the Cold. Whether any such Persons perished on
 our Roads in *England*, I have not heard. But we were
 told of some that did; particularly some Post-Boys, and
 if I misremember not, some Drovers also. Our Fresh-
 water Fish also were many of them destroy'd in Ponds
 that were shallow, and especially if long frozen over;
 some for want of Air, where the Ponds were not kept
 open; and some with the cold Air at the Holes in the
 Ice, where in great numbers they came to get Breath. On
 the *Italian* Coast some of our poor “ Mariners on board
 “ our Men of War died of the Cold; and several lost
 “ Parts of their Fingers and Toes: As the before named
 Dr. *Newton* writes to me.

But the greatest Sufferers in the Animal-Kingdom were
Birds and *Insects*. *Robin Redbreasts*, which before the
 Frost were numerous, are since that very scarce about us,
 only here and there one to be seen. Nay notwithstanding
 their Recruits in the following Summer, yet even
 still, in this succeeding Winter, their scarcity remains.
Larks also, both *Wood* and *Sky-Larks*, which used plen-
 tifully to entertain us with their pleasant Melody, became
 in a manner Rarities in our Country the following Spring
 and Summer; only one here, and another half a Mile or
 a Mile off. Neither are they as yet become so numerous
 as heretofore. But whether this was an universal Cala-
 mity that befel that Family of Small Birds, or whether it
 only happened to our *Essex-Larks*, or whether they were
 not driven from these Parts by the Frost, I cannot say;

because I have been told that in some other Countries of *England*, which abound in large common Plough'd Fields, and where Larks are commonly more numerous than about us, they have had large Flights of Larks this present Winter 1722. But I have lately enquired of the *London-Poulterers*; and they tell me, they have Larks from almost all Parts of *England*, and have not this following Year received a Quarter, nay, scarce a Tenth part of the Larks they used to have, by reason the Frost killed them, as the Bird-catchers say.

In the *Insect-Tribe*, I have particularly observed the *Pediculus Pulsatorius*, or *Fatidicus*, or *Death Watch*, to be great Sufferers. 'Tis that *Death-watch* I mean, which there is the History given of in *Phil. Transf.* No. 271 and 291. where I have taken notice of the great Precaution, and Art of that Insect, to secure it self against the hard Weather, in dry Places within Doors, under downy, light Dust, &c. Notwithstanding which, they seem to have been great Sufferers by the Frost. For few of them appeared the following Summer; and in places where they used in *July* to be very sonorous with their Ticking Noise, only now and then one was heard; a manifest sign of their being either killed, or rendered less fertile and vigorous.

The Effects of the Frost on Vegetables:

But among all the Sufferers by the Frost, the *Vegetables* were the most universal; few of the tender Sorts escaping, to the great Dammage of the Owners. About us, *Bays*, *Rosemary*, *Cypresses*, *Myrtles*, most of the *Phillyrea's*, yea, even *Junipers*, among Shrubs; and *Artichokes*, *Colly-flowers*, and a great many other Olitory Plants suffered greatly. In a word, so great were the Dammages done among the Gardens, that by Enquiries made on purpose among the *London Gardiners*, I have been informed some

of them have lost to the Value of 80*l.* 100*l.* yea 200*l.*

But the most exact Account I have met with, is from that accurate Botanist of the *Oxford* Physick-Garden, Mr. *Ja. Bobart*, in a Letter to the ingenious Mr. *J. Thorpe*, F. R. S. in which he takes notice, That the Damages of this Frost do not come up to those in 1683; which Frost being of longer continuance, cleft the *Oaks*, and Bodies of the *Vines*, &c. But in the last Frost there were Intervals of Relaxation, besides several considerable Snows, which proved a good Guard to many Plants. But the Snow melting, and the Cold withal continuing, proved of evil Consequence to many Bulbous and Tuberos Roots, and abundance of other Things. “ But (he saith) the sharp, dry, and cutting Winds from the North, and North-East, were most Destructive to many of the Ornaments of our Gardens, which before seem’d so good Natur’d, as to be almost naturaliz’d to our Clime; as *Cypress*, *Bays*, *Rosemary*, *Alaterni*, *Phillyrea’s*, *Arbuti*, *Laurustines*, &c. as also to most of our Frutescent Herbs, such as *Lawenders*, *Abrotonums*, *Rue*, *Tyme*, and divers others of such Race, especially such as had their Heads above the kind covering of the Snow. And not such Exoticks only, but some of our own Natives, as is visible in most of our *Furze-fields*, and divers *Hollies*, especially of the finer strip’d Race, have felt the smart of such the Vigour of the Season, by the loss of their Leaves, beautiful enough, and sometimes their Lives,

“ And what (he saith) hath been more observable this Year, than in others, is, The Sap of our finer mural Fruit-Trees, as of *Peaches*, *Nectarines*, *Apricocks*, &c. was so congealed and disorder’d, that it proved stagnated in the Limbs and Branches, and equal to Chills in Humane Bodies; which in too many Parts of the Tree, turned to so frequent Mortifications, that it is very much to be doubted whether sufficient Vigour

“ is ever to be expected from them, to be worth their
 “ standing, notwithstanding their weak Endeavours of
 “ shooting, and recovering of such their Maladies, seem-
 “ ing to make work for another Winter to compleat,
 “ what this hath so unhappily begun.

“ And it is no less observable than extraordinary, That
 “ the very Buds in these finer Trees, as well Leaf-Buds,
 “ as Blossom-Buds (which are but the Ovaries of the
 “ succeeding Fruits) were quite killed, and dry’d into a
 “ farinaceous Matter, by the too great Sharpness of the
 “ Cold, before they grew out, though Life remained in
 “ the Branch.

“ The *Plumbs*, being more hardy, produced their
 “ Blossoms well enough; but through the chilling Wets,
 “ before mentioned, which happened too plentiful about
 “ that time, and the great Defect of nutritive Warmth,
 “ they grew weak; with their little Stalks, or Pedicles
 “ languishing, and turning Yellow, generally dropt off,
 “ and came to nothing.

“ It might (he saith) reasonably have been supposed,
 “ that such conjoyn’d Cold, with repeated Wets, should
 “ have destroy’d the injurious *Insects*, which usually in-
 “ fest the first Product; but even in this Year, they have
 “ proved vivid, in too great plenty among the *Apples*
 “ and *Pears* (especially the former) whose Blossoms, as
 “ well as Leaves, have been too copious pabulum for
 “ these voracious *Erucas*, whose Eggs lay dormant all the
 “ Winter, so dry in their Bags, that there were so ma-
 “ ny escaped from being frozen, that in many Places they
 “ proved enough to destroy the whole Verdure.

“ *Fig-Trees* (he tells us) whose softer Texture was
 “ more easily penetrated, have suffered much, most of
 “ them being cut down, to begin the World again.

“ Many *Exotick Greens*, and rare Plants coming from
 “ *Africa* and other warm Regions, have mightily suffered,
 “ espe-

“ especially in such Stoves and Conservatories as were too
 “ parsimoniously defended by Fire.

What he observeth concerning the Destruction of
Wheat, was I believe a general Calamity, as also the Particulars he takes notice of much the same in other Places too, *viz.* “ Where the Land was poor, and coldly exposed, there the *Wheat* was killed; that many Lands of
 “ Wheat escaped tollerably well on the warm side, when
 “ the other side was quite killed with the Extremity of
 “ Cold.

By the *warm and cold Sides*, I suppose our ingenious Observer meaneth the sunny and shady Sides. But with us the Wheat suffered rather more on the Southern, sunny Side, than the Northern; I suppose by reason the Ground was somewhat opened by the Sunshine, and the covering of Snow melted, and way thereby made to the Severity of the Nocturnal Frost. Upon which account I have heard it said by some skilful Observers, *That Vegetables suffered more the last Winter from the Sun than the Frost.*

In *Essex* also, about us, I observed many small Fields of three or four Acres of Wheat, to escape pretty well, where fenced with thick high Hedges against the cold Winds, especially where they were covered long with Snow; at least they came off better than other Parcels of Land exposed to the Winds, that dislodg'd the Snow, and aggravated the Cold also. So in the Parish where I live, the best Pieces of Wheat were such, I observed, as lay on gentle Descents facing the West or S. W. especially when guarded on the Eastern, or N. Eastern side with a Hill, or a Wood; which fenced off the cold piercing Easterly and North Easterly Winds.

And not only *Shrubs* and *Plants*, but the larger *Trees* have in some Places had their share of Suffering too. But it was observed by some ingenious Persons at one of the Meetings of our Society, That the Calamities which befell Trees, arose not purely from their being frozen,
 but

but principally from the Winds shaking and rocking them at the same time, which rent and parted their Fibres.

These have been some of the most remarkable Effects of the Frost on the *Vegetables* of the more *Southerly* Parts of our Island, the *Northerly* (as hath been observed) escaping better; as will appear by another part of the forementioned Letter of *Sir Rob. Sibbald* in these Words: "The Corn did not rise, and ripen so soon as wont; but, Blessed be God, there hath been a plentiful Harvest, well brought into the Barns and Yards. And the Price of Victuals (which was high) falls lower daily. There was no greater number of those who died, than was usual during the Winter formerly.

As to other Places. I find the Effects were, in the more Southerly Parts of *Europe*, much the same on their *Vegetables* as in ours. In *Italy* my forementioned Illustrious Friend, *Dr. Newton* saith, "Almost all the *Lemon* and *Orange-Trees*, with those of the like kind, are destroyed in this Country by the Frost, and a great many *Olive-Trees*. The Leaves of the *Bay-trees* have the same Colour now, as all others have when they are falling in *October*. Besides which Calamities upon *Vegetables*, there are two other Disasters he tells me of, owing probably to the Frost, which I shall mention here, for want of a more convenient Place to bring them in. One is a Disaster that happen'd at *Florence*, where "on the side of a Hill were formerly many Buildings, which twice falling down; by the Earth giving way, a Wall was Erected in the time of this Great Duke's Grandfather, with an Inscription on the Wall, which separates the Ground from the next Street, that for the future no Person should build there. After the Great Frost, this Wall hath fallen down too. The Hill is full of Stones, and they will have it, that as those increase, the Ground is pushed forward, and thereby thrown down

“ down. But I am apt to think, the Frost might have a great Concern herein.

The other Accident befel at *Pisa*, where he saith, “ That upon the melting of the Snows, and the great “ Rains which fell after the Frost, although the *Arno* did “ not swell over the Banks at *Pisa*, yet the Water at “ some distance from the River, in a middle Row of “ Houses, betwixt the River and the Great Street on “ the North-side, with great Violence broke out, and “ if it had not been immediately perceived, and the “ Breach stopp’d by the throwing in of a great quanti- “ ty of Bricks and Timber, that part of the Town might “ have been in danger of being drowned, where the “ Palace, and the *Publick-Schools*, or, as they call it, the “ *Sapienza* stand.

Dr. *Mich. Angelo Tilli*, the Learned Botanick Professor at *Pisa*, hath only told me in a Letter he favoured me with from thence, “ That the Frost hath destroyed a “ world of Trees both in City and Country about them. But I wish he had been as particular in his Account thereof, as our Eminent Botanist before mentioned.

In *Switzerland*, among the high *Alpine* Ridges, they felt dire Effects of the Frost, ~~but yet some Places~~ were so happy as to escape. Of which Dr. *Woodward*, before commended, imparted to me the following Account he received from Mr. *John Schenchzer*, Brother to our Industrious and Ingenious Member, Dr. *John James Schenchzer* of *Zurich*. His Words are, “ Effectus tristissimos, “ quos Hyeme præteritâ sensere Arbores nostræ, etiam “ crassissimæ, præsertim *Juglandes*, *Vites*, non prorsus “ sensere loca quædam præaltis versus Septentrionem ju- “ gis munita. *Vesena* ad Rivarium-Lacum salvæ man- “ sere arbores & Vites, ut *Vindemia* (apud nos nulla) “ ibi sit copiosa ; *Juglandes* fructibus oncratæ, uti quo- “ que arbores reliquæ, ac si in diverso succrevissent a “ vicinis locis Climate. *Galanda*, montis altissimi in con- “ finis *Rhetorum* & *Sarunetum*, radicibus adjacet pagus

« *Vettis*. Hujus incolæ vix unquam mitiorem Hyemem
 « habuisse testantur, dum interim incolæ Pagi proximi
 « *Vallentia*, supra Thermas Fabarias siti, durante summo
 « Frigore, aditu mutuo prorsus intercluso, veriti fuere,
 « ne *Vettienses* omnes frigore perierunt. E. contrâ Sylvæ
 « Boræ expositæ, & Arboribus etiam vivacissimis, Abie-
 « tibus, Taxis, Laricibus consistæ, quasi adustæ rufum in-
 « duere colorem, foliisque nudatæ.

Lastly, as to the Northerly Parts of *Germany*, the Case
 was there, after the manner it was with us; which
 Mr. *Remus* being very curious and particular in, I shall
 insert the particular Matters he takes notice of here.
 « Arbores, saith he, et frutices ultra nivis superficiem
 « prominentes magno numero Frigus destruxit. Cerasus,
 « Malus, & Prunus risere Hyemis minas. Multa ramo-
 « rum segmenta mense adhuc Martio Microscopio suppo-
 « suit D. Præses [that is Dr. *Wolfius*, the Learned and
 « Ingenious Author of the *Elem. Aeromet.* Printed at
 « *Leipsack*] nec quicquam integritati & turgescentiæ fibra-
 « rum deesseprehendit. Flores copiosi in
 « Ceraso, rariores in Malo, &c. Nuces Amyg-
 « dalæ, Mali Persicæ & Mali Armeniacæ nobiliores pa-
 « riter ac ignobiliore, Rosarum frutices tantum non
 « omnes interierunt, Pyri plurimum damni perpeßæ.
 « Vites sub terrâ defossas & satis tectas a frigoris sævitie
 « immunes vidimus, at reliquas contra illud non suffici-
 « enter munitas prorsus destructas & ipsi conspeximus,
 « & Novellæ &c. Commemoranda vero sunt
 « quæ D. Præses annotavit. Cum statim ab æqui-
 « noctio, nive liquefactâ, & glacie resoluta, aditus in
 « Hortos pateret, Cortex, Lignum, & Medulla in iis
 « arboribus, quibus Frigus infestum fuerat, e. g. in Pyro
 « & Malo Armeniacâ, nigricabant. Unde multi :
 « extirpabant. Cum segmenta ramorum, qui præteritâ
 « ætate adoleverant, microscopiis subjicerentur, fibril-
 « læ

“ læ hinc inde disruptæ, non secus ac in ligno putrido,
 “ conspiciebantur: In reliquâ autem ramorum parte
 “ nulla istiusmodi disruptio notari poterat, succus unice
 “ desiderabatur & viriditas. Enimvero cum circa medi-
 “ um Aprilis arbores calore Solis foverentur, in Malis Ar-
 “ meniâcis ex ligno seniore passim novæ Gemmæ erum-
 “ pebant, in quibusdam etiam ex juniore ibi provenie-
 “ bant, ubi flores progerminare debuerant; in nonnul-
 “ lis nullus furculus protrusus. Pyri Gemmæ omnes evo-
 “ lutæ, & Flores prodire; consueto tamen vigore ple-
 “ rumque destituti, atque hinc nulla Fructuum rudimenta
 “ relinquentes. Tunc temporis viriditatem plenariam con-
 “ sequebatur Cortex, nigrior ex centro Medullæ versus
 “ peripheriam migrabat, Ligni substantia candorem recu-
 “ perabat. Fibrillæ novi anni adhuc nigricabant, per
 “ Microscopium tamen conspectæ non minus ac fibrillæ
 “ eadem in Ceraso & Malo, quas frigus intactas relinqui-
 “ rat, succo turgescere videbantur. Equidem medulla
 “ sub Gemmis insolitâ nigredine passim tingeatur; radi-
 “ cula tamen Gemmæ in furculum protrusæ admodum tur-
 “ gida & virens oculo armato fistebatur Notabile
 “ vero, quod, quemadmodum Frigus Pruno, ita etiam
 “ gemmis Malorum Armeniacarum intra corticem furculo-
 “ rum Pruni immixtis pepercerit, in proceras frondes nunc
 “ excreſcentibus juxta arbores sui generis, quibus ne uni-
 “ cam Gemmam intactam reliquerat Frigus.

Having dispatched the two things proposed, the *Degree and Effects* of the Frost, I intended here to have put an end to my History: But upon a review of the fore-mentioned Dissertation, I cannot easily forbear saying something to

The Causes of the Great Frost.

These are to me, I confess, so very much hidden, that upon that Account I intended wholly to have passed over

this Matter; but the last commended Author having ingeniously enquired thereinto, I shall as briefly as may be shew his Opinion. The Fountain of Heat enjoy'd by the Earth, being the Sun, and that Heat being not always the same, he enquireth into the reason why it is not so. The Variation of the mutual Distance between the Earth and Sun at the Apogee and Perigee; the mutation of the Earth's place in respect of the Heavens, or its being justified at a greater distance from the Sun, and the Obstruction of the Solar Rays by the Spots on the Sun, he (after ingenious Enquiries and Calculations) rejects. And as to the true Causes, having assigned good Philosophical Reasons for the Perpendicular warming more than the Oblique Rays, for the Wind cooling the Air, and the North and East more than other Winds, &c. he then enumerates his Causes in these Words: *Ex hæcenus dictis apparet, quam ad Frigus hybernium producendum concurrere possint. Nimirum ex parte Solis requiritur ingens a vertice distantia, & exigua supra Horizonte mora: Ex parte Telluris vero, Atmosphaera exhalationibus plena, & nubibus gravida; Ventique Orientales & Septentrionales, præsertim impetuosius requiruntur. Omnium autem maximè necessarium, ut actiones Solis & diu, & tum imprimis impediatur, quando causæ Frigoris concurrunt.*

Having thus assigned his Causes, he then applies them to his five Periods, and the more remarkable Accidents that happened in them.

But after all, notwithstanding I like, for the most part, his Causes, as being those which are the common and ordinary ones, yet there are some other more hidden extraordinary Causes, that he hath not reached. For we have all his Causes very commonly concurring in other Winters, without the same Effects as in the last. Yea this present, next succeeding Winter 1742, we have had (besides what is common to all Winters, the Obliviousness

quity of the Sun's Rays, &c. we have had I say) the Winds as much Northerly and Easterly, and as strong; and as much dark Weather; and all concurring too together, as happen'd during the Great Frost: And yet no more than ordinary severe Weather.

But as to misty, cloudy, dark Weather, which our ingenious Author reckons among his principal Causes, I am so far from thinking it a Cause, that I rather take it to be the reason we have not more frequent severe Frosts, at least in our Island-places, surrounded by the warm Vapours of the Sea. Clouds and Vapours do indeed intercept, and keep off the Sun-beams; and probably imbibe and retain a great deal of Warmth themselves; nay perhaps they may (as he saith) reflect back some of the Sun-Rays: But we constantly in Winter find, that the fewer the Exhalations are, and the clearer the Air, and after the Warmth of the Sun by Day, the sharper the Frost is at Night.

But now, after that I have denied the sufficiency of the ordinary Causes, it may be expected I should subjoin others. But as I have declared my Ignorance of them, little can be expected. Only thus much seems to me reasonable: That the ~~great Mint of Meteors~~ being the Superior Regions of the Air, and the Source of Exhalations being the Terraqueous-Globe, in those two Places we are to seek for the farther, and more grand Causes of the late Frost. And in the fourteen and more Years Observations I have made of the Weather, &c. I have found a great deal to be attributed to the Increases and Decreases of the Cold of the Upper Regions, as also to the inner Dispositions of our Globe, at least to the greater or less Plenty of Vapours and Exhalations. But not as yet having Observations enough to clear and demonstrate my Hypothesis, I must beg leave to defer what I might have said (and may perhaps at some other time do,

do, if God spare Life) which may give some Light to our present Phœnomenon.

Thus having 'given as full, but withal as brief, a Relation, as well I could, of the Great-Frost in our *European* Parts, I should have been glad to have done the same for the *Asiatick* and *American* Parts of the World. But not having any Accounts thereof, and (living in a somewhat obscure Part of the Country) not having opportunity to make Enquiry of Travellers, I must be forced to omit this material Part of the History. But if I should be so happy as to get any good Accounts thereof, this Honourable Society may expect a Supplement hereunto.

II. *Microscopical Observations upon the Configuration of Diamonds : In a Letter from Mr. Antony Van Leeuwenhoek, F. R. S.*

Honourable Gentlemen,

I Take the Liberty of troubling you again with these my following Observations, which I have had lain by me these three Years, within which time I caused them to be delineated by my Painter, and engraven upon a Copper-Plate; the Draught of which I here send You.

I have been often ask'd, whether I could discover any thing particular in the Configuration of Diamonds; whereupon some Years ago, I took a small polish'd Diamond, and broke it to Pieces with a Pair of Pincers; but having observed nothing more in the broken Particles thereof, than in those of Common Glass, I laid aside all Thoughts of it for that time.

Some Months ago it came into my Head, that I shou'd have made my Remarks not upon polish'd, but ruff Diamonds.

Whereupon I procur'd a few small ruff Diamonds from a Jeweller, some of which I placed before a Microscope, and observed one of them more particularly; concerning which I concluded, that all those Streaks or Fibres which I saw in it, were nothing more than the several Coagulations or Augmentations it had receiv'd from time to time, and that in a very short space.

Fig. 1. A. B. C. D. E. F. represents a small Particle of a little Diamond, as it appear'd thro' a Microscope; in which between A. and B. as also between C. D. E. and F. you may observe a great Number of Lines or Fibres in the said Diamond; each of which Fibres was occasion'd as I suppose by the Increase or Accession of new Matter, which whether it was form'd in one Day or more, is not much to the purpose.

Now that the increase of Diamonds is made in such an Order and Manner, we may conclude the rather, because we are sure that the same thing happens in the Coagulation of many Salts.

I have taken some of these Particles several times, and laid them upon burning Wood-Coals 'till they were red hot, and in that Condition thrown them into the Water, to see whether they wou'd burst to Pieces, or whether there wou'd be any separation of Matter from them; but that never happening, I must conclude that there was no Air nor any Moisture shut up within them.

One Particle of a Diamond appear'd to the Sight, as *Fig. 2.* G. H. I. K. L. after I had made it red hot, and flaked it in Water several times; in this also, between L. and G. you may observe several small Streaks or Fibres: and when I observed it the last time, after I had taken it out of the Water, it appear'd betweca L. G. H. and I. just as if some small Scales had been separated from it; just like the shining or glistering Parts which I have often seen in several Stones, and particularly in the great Flint-Stone that is brought in Ships from *Greenland* for Ballast, when the Whale-Fishing is not good, and when its Chryselline or Diamond Transparency is gone.

Fig. 3. M. N. O. P. Q. R. represents also a Particle of a Diamond, as it appear'd thro' the Microscope, after it had been made several times red hot and thrown into cold

cold Water ; in the middle of which one might perceive such Slits or Cracks as one might compare to the Top or Cycling of an Unwainscotted Church within side, which was no unpleasant Spectacle, but cou'd not be so well traced by the Painter as it ought to have been ; but whether this Appearance be natural to the Diamond, or whether it proceeds from the breaking it in Pieces, is unknown to me ; but my Opinion is, that it was not occasion'd by its being made red hot, and thrown afterwards into the Water, for if it had been so, the Diamond wou'd have been separated into a great many Particles, or one wou'd have discovered several Cracks or Flaws in it: For a certain Goldsmith having bought several small Stones for Diamonds, and which many People wou'd have taken for precious Stones, he gave me three or four of them to view, and I presently judg'd them not to be Diamonds, for they had neither sharp Points nor smooth Sides, but appeared like transparent Particles of Sand, whose Angles or Points were worn off ; he allow'd me also to make them red hot, and to throw them into the Water afterwards, which I did, and observed by the help of my Microscope, that they had got a great many Rents or Cracks in them, insomuch that with a little squeezing they wou'd crumble all to Pieces.

Fig. 4. S. T. V. W. X. Y. represents the small Particle of a Diamond, no bigger to the naked Eye than a small Grain of Sand, from whence you may judge also of the largeness of the other Diamond Particles, represented by the preceding Figures ; this last mention'd Particle was not put into the Fire. You may also observe at S. T. V. W. and Y. the sharp Points of the said Particle.

From whence I conclude, that I was right in my former Remarks concerning the Particles of Sand ; to wit, that the said very small Particles consisting of regular

C c c c

Points

Points and smooth sides like Diamonds, were soft at their first Coagulation, but grew greater and larger by the Accession of new Matter, 'till they became large Grains of Sand; and moreover, that some Diamonds were form'd just after the same manner.

Now as we find, that in the Dissolution of Silver by *Aqua fortis*, some of the small Silver Particles are Coagulated in Chrystals of the figure of Diamonds; and that the Sugar which is boiled to a Syrup in order to make Sugar Candy, is also Coagulated into such Particles; so we may likewise suppose, that at the time when the Diamond Particles coagulate, a great deal of the same Matter whereof they are composed is in the Air, but not to be perceived by our naked Eye, nor the Quantity thereof to be known 'till it is Coagulated into a Body: And who knows but if a Shovel of that Earth, out of which they dig Diamonds, were brought over and carefully Examind by a Microscope, one might discover abundance of exact and compleat little Diamonds of an unspeakable smallness.

I know there are a great many People who are of Opinion, that many things lying in the Bowels of the Earth, and especially Diamonds, grow bigger and bigger, and that their Increase is occasioned by subterraneous Fires driving the Damps up higher and higher, which Damps they say are impregnated or loaden with Mineral, Chryselline or Adamantine Particles.

But I am not of that Opinion, for if it were true that an Adamantine Matter were produced by the Subterraneous Fires, driving up the Damps, we must conclude, that that Matter wou'd be fluid, and then that fluid Matter so driven up, wou'd Coagulate with the Diamonds it met in its way, and make them greater; but if that were true, this Adamantine Matter so driven up, cou'd not have the Power to disperse the Earth or Sand with which the Diamonds

monds were surrounded, in order to its own Accretion or Coalition therewith, but this Coagulating Adamantine Matter wou'd involve Earth, Sand, or whatever other Particles lay in its way, by which means there would be no such Thing as a clear and clean Diamond digg'd out of the Earth.

I know that there are some ruff Diamonds in and about which there is an earthy Matter, but that does not seem strange to me, because it happens, as I imagine, in the very Coagulation of the Diamonds, and when the Parts thereof were soft.

Among several Hexangular Picces of Rock-Chrystal, I have observed some whose sides appear'd very smooth to the naked Eye, and whose Points did not at all resemble Chrystal, but rather a dark Earth; which I conceive to be only occasion'd by the neighbouring Earth's insinuating itself into the Points of the said Chrystal, at its first Coagulation, and when it was soft.

Let us now suppose a Diamond lying in the Earth, and growing continually greater, whose Axis was the 4th part of an Inch, or 150 Hairs breadth, and that such a Diamond in the space of Ten Years was so much encreas'd, that its Axis or the Bigness of its Body was augmented on every side half a Hairs breadth, and so proportionably every Ten Years; by consequence then in the space of 3000 Years its Axis wou'd be Three Hundred Hairs breadth greater, by which means the Diamond wou'd be Twenty Seven Times bigger than at first.

Now if we suppose, that a Diamond in the space of Ten Years does increase on all sides a Hairs breadth, its Axis wou'd be two Hairs breadth, which in 3000 Years wou'd be 750 Hairs breadth, and then the last mention'd Diamond wou'd be 125 times bigger than the Diamond whose Axis was 150 Hairs breadth: Now supposing a Diamond whose Axis was 150 Hairs breadth, and its

Weight 7 Carrats, what a prodigious Diamond wou'd that be whose Axis is 750 Hairs breadth, and where shall we find such a Diamond? I hope that your Honours will find something in these Observations which may be acceptable to you, and in the mean time I shall remain,

Honourable Gentlemen,

Your most Humble Servant,

Antony van Leeuwenhoek.

III. *Part of a Letter from the Reverend Mr. W. Derham, F. R. S. to Dr. Hans Sloane, R. S. Sec. Giving an Account of a Child's Crying in the Womb.*

S I R,

ON *Saturday* last I gave my self the Satisfaction of visiting a Woman brought to Bed this Day seven-night of a Boy, that had Cry'd in her Womb, at times, for five Weeks wanting one Day. The Child appears to be Lusty and Strong, and is, since its Birth, a very quiet Child. The Woman's Name is *Clark*, living above two Miles from me, in the Parish of *Hornchurch*.

She told me, the first time the Child cry'd was in the Night, as she lay in Bed, after a great Pain which forced her out of Bed, and gave her Apprehensions of her Labour being nearer than her Reckoning. And every time after, whenever the Child cry'd, she had violent Pains like those of Labour.

From the very first time of its Crying, the Child settled it self on the Mother's Left-side, and she never perceived it to stir in the least, 'till its Birth approached.

Scarce a Day in all the five Weeks escaped without Crying little or much. But the Woman observed, that every other Day it cry'd the most, and most certainly. The Midwife told me, she heard it cry seventeen times in half an Hour. Its Crying might be heard into the next Room; and sometimes it

se. med

seemed to be so Hearty, that the Child would sob again.

Both the Mother, and Midwife (a sensible Woman in her Business) answered me a great many Questions, some of which *Ευπερίεως* *ἔνεκα* I mention not. Only in general they told me, they found no great Difference between her in her Case, and other Women in the same Condition. I asked the Woman whether she had receiv'd any Falls, or Hurts, or was troubled with Longings more than with her Child before? (for she hath had one Child before.) She told me she had received no Hurt, but was more inclining to Longing; but had what she long'd for.

S I R,

Your Humble Servant,

Upminster, Novem. 13:

1709.

'W. Derham.'

IV. *A short Dissertation concerning the Child's
Crying in the Womb. By the Reverend Mr.
W. Derham, F. R. S.*

I Have already given the Society a Relation of the most material Circumstances of the *Vagitus Uterinus* that happened lately near me. That Account was somewhat hastily written, without considering the manner of the Fœtus's Life, and the Disputes about it among some of the most Learned Anatomists. And having since more maturely considered the Matter, and made some farther Enquiries into the Case, I hope a short, and farther Dissertation upon that Subject will not be unacceptable; especially because I find the Case near me to be more considerable, or at least that a better Account may be given of it, than I find of any in the Authors I have consulted about it; and it may perhaps conduce in some measure to the ascertaining the Fact, which some of the most considerable Members of our Society (as some of the most Learned Authors) called in Question.

Among the Authors that question the Fact, two of the most considerable are *Etmuller* and *Diemerbroeck*. The Learned *Etmuller* declares *Diemerbroeck's* Opinion, as well as his own, in his *Dissertation de abstruso Respirationis Humanae negotio*, Ch. 9. Where he treats of our famous *Dr. Harvey's* Probleme, *Why the Fœtus after Delivery, and before it hath Breathed, can live for some Hours in its After-burden, &c;* but having breathed but once, cannot live scarce a moment in that manner? *Etmuller's* Words to our purpose

pose are, *Vagitus Uterinum invincibile nonnulli existimant argumentum pro Respiratione Fœtus in Utero demonstranda.* Sed cum muliercularum, quæ plerumque in hisce casibus invocantur testes, sublesta admodum fides, nec satis circumspecta sit observatio, ut pro hujus Problematis hujus resolvendi inferre queat; merito suspicamur cum Clariss. Diemerbroeckio, *Vagitus, si quis certo observatus fuerit, e sibilu intestinorum & flatulentorum a fœtu compressorum ortum duxisse, qui sæpe mirus auditur, suspiria gemitusque in quibusdam mentiens.* Similia quoque ad pipientium Pullorum, intra ovi testam adhuc existentium, sonum, quem editum ferunt aliquando, reponimus: Preprimis cum extenuatus aquæ vapor ad corpora tenuiora allisus non minus sibilum excitare observetur: uti id experimento probat Illustr. Boyleus.

The Matter of Fact being thus called in Question, may in my Opinion receive an Answer, in some measure, from the Case I have spoken of, and into which I have made some farther Enquiries. Concerning which I must needs say, that notwithstanding I should be as much inclined as any Man to doubt of the Fact, being clearly of Opinion that the Fœtus doth not live in the Womb by Breathing, yet the Evidence is so clear to me in the present Case, that I am fully satisfy'd it was really *Crying of the Fœtus*, and not Groaking of the Guts, or Womb, or the Effect of any Ruminine Imagination.

For here we have a thing happening not once, or twice only, but a great many times; almost every Day, and divers times in the Day; and that for near five Weeks together. Enough to have discovered any Mistake, or to have undeceived even a fanciful Person.

In the next Place, we have the Child heard to Cry aloud, so as to be distinctly heard by Persons in another Room. Consequently the Hearers could more easily, and easily distinguish whether the Noise was *Crying* or *Groaking*.

Croaking. The Description the Mother and others gave me thereof was, " That the Noise the Child made, was " as if a Born-Infant had Cry'd eagerly, shut up close in " a Tub.

In the third Place, The Crying seemed to be so eager and hearty, as to end in Sobbing, like what is observable oftentimes in Born Infants.

In the fourth Place, It was heard not alone by the Father and Mother, or one or two besides, but by many, or most of the Neighbourhood, both near and farther off, and many of them Persons long used to Children ; who do all with the greatest Assurance affirm it to have been as manifest Crying, as ever they heard from a Born-Infant, and nothing like any Noise of Wind, or the Guts : As on Enquiry they all particularly told me.

And in the last Place, The Midwife told me, that laying her Hand on the left side the Woman's Belly, where the Child lay when it Cryed, she could plainly feel a Motion under her Hand, like that of Respiration, every Blast of the Child's Crying sensibly touching upon her Hand.

These Particulars being considered, do not only prove the reality of the Thing, but shew the Case to be very considerable. I have met with many Instances of this Nature in divers Authors, but not one that was of so long Continuance, and in which there were such frequent Reiterations of the Crying. Some of the best attested Cases I have met with, may deserve to be recounted here. And the Learned *Persascha* of *Basil* hath given us so good a Catalogue of them in the third Observation of his *Observ. Medic.* that I shall go no farther for more. And putting by the Cases he mentions, attested only by vulgar illiterate Persons, I shall name only a few that seem to have more sensible Persons for their Evi-

dence. *Ant. Deusingius* in his *Dissert. de Generat. Fœtus* tell us (he saith) " how that he had it from " his Collegue *Momms*, that the Child cry'd in his " Wife's Womb, and the same befel the Wives of " Mr. *Salmuth*, and Mr. *Grænwoit*. His next Relation is that of our Dr. *Needham*, of the Fœtus crying in the Womb of an *English* Woman of Quality, as she, her Husband, and Chaplain were together at Supper. Which being a Story that every one is acquainted with, that hath seen the Doctor's excellent Book *De formato Fœtu*, I shall not mention the Particulars of it. The last Instance is of *Christian II.* King of *Denmark*, who was heard to Cry before he was Born. Now these being Cases attested by Persons that may be supposed of better Understanding than the fanciful Vulgar, seem to claim somewhat more of Credit: The latter being the Case of a King, and in all probability heard by some of the best Quality about the Court; the next heard by the Chaplain as well as Persons of Quality themselves, and that three times one after another; and the former coming within the Cognisance of Gentlemen, and they probably Men of Learning too.

Upon this whole Evidence (and more I could have added, even from the time of *Hippocrates*, I say from hence) I conclude, That the Fœtus doth really Cry sometimes in the Womb; although how this is performed is hard to account for: Surely not without Respiration. And therefore I am apt to think, that although the Fœtus doth not ordinarily breathe in the Womb, yet it is possible for it to have an occasional, temporary Respiration there. But whether in such Respiration, any of the Blood passeth into the Lungs, or whether it doth not continue its Circulation through the *Foramen Ovale* only: Or if any more than ordinary Blood should by such Respiration get
into

into the Lungs, whether it may not easily, and without Inconvenience be discharged thence, during this State of Life the Fœtus leads in the Womb: All these Doubts I must confess my self unable to determine. But however thus much favouring my Opinion, may be observed in the *Sea-Calf*, and such other Animals as have the *Foramen Ovale*, That the Circulation of their Blood is continued, notwithstanding the discontinuance of their Respiration for a long time.

As to the *Peeping of Chickens in the Egg*, about which *Etmuller* hath the same doubt, as of the *Vagitus Uterinus*, I have my self divers times heard that, both from Chickens and Ducks. And a Person more Conversant in such Matters than my self assures me, That a little before the Hatching, she hath often, and can at any time cause some Chickens, and Ducklings to peep in the Egg. She saith, that sometimes whole Nests of Eggs will yield a Cry, sometimes only some particular Eggs: But that such Eggs as have once afforded a Peeping, may be made to Peep and Cry at any time, by shaking the Egg, and putting the Youngling into a disorder. And sometimes where there hath not been any Noise before heard, the Bird hath been made to Cry, by shaking the Egg in which it was enclosed.

The Cause of this Peeping in the Shell, I take to be from some Uneasiness the young Bird may find there. It being arrived to its perfect State in the Egg, is either weary of its Confinement therein, and desireth more liberty; or else it lies uneasily, or is offended with shaking, and therefore Peepeth and Cryeth, as when uneasy out of the Shell.

And after some such manner I take it to be with an Humane Fœtus; that it is in some Disorder, and uneasy in the Womb, and therefore Cryeth as well

in, as out of it. Thus I am apt to think it beſel the Foetus I have ſo often ſpoken of, *viz.* That it lay very uneaſily in the Womb all the while it Cry'd there, the Mother being in great Pain before, and during the time of the Child's Crying, and the Child it ſelf being cloſely confined, and pent up on the Left-ſide the Mother's Belly, *all the time of the Crying only, and not all the 5 Weeks*, as by miſtake I told in my former Letter. Perhaps alſo the Child might find ſome Uneaſineſs from a Bone the Midwife told me ſhe found to ſtick out ſomewhat farther than ordinary: Which, upon Examination, I take to be one of the Vertebrae of the Back-bone. And if this Bone cauſed Uneaſineſs to the Child, it might alſo by that means occaſion perhaps the Woman's Pains I ſpoke of. But theſe Suppoſitions and Gueſſes, which are only Imaginations of my own, may probably diſagree with the Obſervations and Notions of Perſons better ſkilled in Anatomy than my ſelf, and are therefore ſubmitted to their better Judgments by

Their Humble Servant,

W. Derham.

V. *A Letter from Mr. Antony Van Lecuenhoek, F. R. S. to John Chamberlayne, Esq; F. R. S. Containing his Observations upon the Edge of Razors, &c.*

S I R,

IN your last acceptable Letter dated from *Westminster* the 2d. of *August*, I observe that you desire me to turn my Speculations, and to give you my Thoughts upon several Appearances relating to a Razor; particularly to say something concerning its Edge and Sharpness, which in a good Razor is so fine and so nice, that it is subj. to the least Change and Alteration in the Weather; and particularly that Cold has such an Influence upon it, as to spoil and blunt its Edge, insomuch that it will hardly cut a Hair asunder.

In answer to your said Letter, I must acquaint you, Sir, that I shave my self, and that ~~my~~ Razor, which I always use twice a Week, and which I have had above Thirty Six Years, was never Ground but twice, and yet it cuts very well; but I set it sometimes upon an Oyl-stone or Hone, yet not as I observe some Barbers do, who stroke it above Twenty five Times on one side, and then again as many on the other; whereas I on the contrary pass my Razor once only on one side, and that very gently with the Edge against the Stone, and then on the other side in the same manner; and so continue about ten or twelve Times; after that I pass the Razor, with the Back of it downwards, upon a Leather prepar'd with *Tripoly* [which the Silver-smiths use to Polish or Clean their Plate with.]

Wth R

When I look upon such a Razor thro' my Microscope, I stand amazed at the great number of Gaps and Notches that I see in the Edge thereof, and wonder how one can shave ones self so softly therewith; nor does my Razor refuse to do me Service even in Winter and cold Weather, tho' I must own at such times the Shaving is a little more painful, but that I have hitherto thought, was only occasion'd by the Hair of the Beard being harder in Winter than Summer, when 'tis cold Weather I always keep my Razor in a Room that has Fire in it.

Now as to what concerns the Razor's becoming blunt in cold Weather, I can conceive no other Reason for it, but that the *materia subtilis*, or exceeding fine Matter, which is in all Metals, and which we may compare to Fire, is by the Cold driven out of the Edge of the Razor; by which means the Steel becomes so stubborn or hard, that in a fine Razor it makes Notches, and is blunted by the Hair. I have also experienced, that after having shaven the Beard with a fine Razor, and, attempting to Cut some of the little Hairs in the Eye-brows, which were harder than those of the Chin, notwithstanding that they were a little softned with Water, several Notches were thereby made in the same Razor.

I asked a certain skilful Barber, what difference he found in his Razors in very cold or hot Weather; who informed me, that when it was very Cold, he always dipt his Razors in warm Water, which made 'em cut much the better.

I have thought fit to acquaint you with the manner of my preparing my Leather upon which I pass my Razor. My Shoe-maker furnish'd me with a Piece of Leather, that is very smooth upon the side next the Flesh, and of about two Fingers breadth; this I fasten'd with Glue to a thin Board of the same breadth, and when 'twas dry,

I smear'd it all over with a Tallow-candle ; and then I held it over the Fire a little, 'till the Grease had insinuated i-~~ts~~elf into the Pores of the Leather, and this I repeated three times ; after which I pour'd all over it a little Tripoly wash'd clean, which I workt into the Leather with the Grease so long, 'till the Grease or Tallow became warm, when I pour'd on fresh, repeating that Operation four or five times, till my Smoothing-Leather was fit for use.

I have also taken fine Powder'd Emery [a Powder or Stone also used by the Silver-smiths to Polish their Plate] which I first steep'd in a little Water, and then pour'd a good deal more upon it ; which having stir'd well together, and afterwards let it stand a little, I pour'd off the uppermost part of the Water that was impregnated with the fine Emery into another Glass ; and after that I put a little Linnen or Woollen Rag into the aforesaid Water, one end of which extended itself to the bottom of the said Emery, which I suppose to remain in the Glass, and the other end of the Rag hung out, in order to draw off all the Water from the subsided Emery ; which Emery being thereby become dry, I rubb'd it into the Tallow'd-Leather in the ~~same~~ manner as I had done the Tripoly before, only with this difference, that I work the Emery in with a Piece of smooth Ivory, or else with a Burnishing-Steel ; this being done, I stroke my Razor softly over it, the Effect of which has been, that Razors, with which I have cut Wood, and which I have thrown aside as useless, have been recover'd to such a Degrée, as to become fit to shave ones Beard again.

The aforementioned Barber complain'd to me, that he had a Razor, which tho' it appear'd very fair to the Eye, yet was so stiff, that he cou'd bring no Edge to it, by passing it ever so often upon a Hone : I desired him that I might look upon it thro' my Microscop,

and found several Notches in it ; but I judg'd that it had been little used to a Hone, because there was so little of it worn away, tho' he inform'd me since that he had set it above Fifty Times, but cou'd never bring it to bear.

I pass'd the same Razor over my Strop or Smoothing-Leather, which I had prepared with fine Emery, and then gave it him again ; and a few Days after, askt him if he had made use of it, who told me he had, and that he had found it very good, and that in sixteen Persons he had shaved with it, he had found but one Beard that the Razor cou'd not Conquer. Now as one Razor is softer than another, I wou'd advise that the soft Razor shou'd be pass'd on a Strop that is prepared with Tripoly, and the hard one upon a Strop prepared with Emery

You say further, Sir, that if one cou'd discover the fine Particles of the Steel, of which the Sharpness or Edge of the Razor does consist, you imagine that one might also be able to find out the cause of the very different Effects produced in the said Razor.

To which I answer, that as for what concerns the fine Particles of Steel, as also Gold, Silver, &c. they are inconceivably small : one may indeed, by the help of a good Microscope, just discover the exceeding small Particles of Gold and Silver, but one cannot perceive of what Figure they are ; and who can tell of what a Multitude of Parts those little Particles, which we see by the help of a Microscope, are, again compos'd : and although we can discover those little Particles of which Gold and Silver are compos'd, because we can dissolve both Gold and Silver in proper Menstrua or Waters, and can as it were unite them with those Waters, and again collect those Particles of Gold and Silver together, fit for our view ; yet this has no Place in Iron or Steel, the fine Particles that compose which, we can only discover in
the

the broken Gaps or Notches of a Razor, for instance, and the greater and courser the Parts are, of which those Metals are composed, as we may see in Cast-Iron, the less valuable are the said Metals; but the finer the Particles are, the more valuable in my Opinion will be the Steel and Iron which they compose.

Now when we view the small broken Parts of Gold, Silver, Steel, Iron, &c. We must consider that each of those Particles, as small as they appear to us, are again composed of a great number of other exceeding smaller Particles, which Nature has knit together; and that these coagulated Particles are yet more strongly united by Fire, and after that are so consolidated by the Strokes and Pressure of the Smith's Hammer, that they seem to us to be but one Body, tho' they do consist of a great many small Particles, the coarsest of which are always obvious when we come to break the Metals: and how often soever you melt any of these Metals, and break them again after they are cold, you will always be able to discover the grainy Particles thereof; but you will find them so strongly joyn'd and riveted in one another, that they appear to be but one Body.

When the Steel is prepared and made into a Razor, and set upon a Hone, we may perceive a great many long Streaks or Scratches of the said Stone upon the Razor; and the Courser the Hone is with Sand, the Courser and Deeper those Streaks are in the Steel. They pass the Razor thus prepared upon one Stone, oftentimes upon a finer, to the end that they may Grind out the aforesaid long Streaks, which it had acquir'd upon the coarse Stone; for every one of such Streaks in the Steel, when it is Sharpned or Ground again, becomes a Notch: when such Notches are Ground out of the Razor upon a fine Oyl-stone or Hone, the Steel, where any of these Notches were, appears to the Eye as smooth as Glass; but when

we come to view the Razor with one of our best Microscopes, one may discover that those long Streaks which cause the Notches, are no more taken away by the Oyl-stone, than when the Razor is Ground on a rough Stone; and the only difference is, that the Streaks of the former are finer than the latter: in short, when one observes with a good Microscope the many Notches that are in the finest Razor, one wou'd wonder how any of them cou'd cut so well. This, Sir, is all that I have to say to you upon the subject of Razors at this time.

Delft, Sept. 10. 1709.

S I R,

Your Humble Servant,

Antony Van Leeuwenhoek.

VI. *A Second Letter from Mr. Antony Van Leeuwenhoek, F. R. S. to John Chamberlayne, Esq; F. R. S. upon the same Subject as the former.*

S I R,

SINCE the Communicating to You my last Thoughts and Observations concerning Razors some Weeks ago, I have often view'd the Hairs of my Chin with a Microscope after they were cut off, and always observed upon the White or Grey Hairs the Streaks which are made by the small Notches that, as I told you in my former, I had discover'd in my Razor, especially when those Hairs were Cut more obliquely than usual; for in such Hairs I have often seen above twelve Streaks, occasion'd by so many Notches that were in the Razor, all within the Compass of a Hair's breadth.

Because I would not trust wholly to my own Judgment, I caus'd a Man of good Understanding to view several Hairs through a Microscope; and I ask'd him, how many little Streaks he observed in the Cut of one of those Hairs? Who answer'd me, Twelve.

Among some of those little Hairs I had shav'd off my Chin, I discover'd several whose Roots were intire, but cou'd not perceive that they had been touch'd by the Razor: this seem'd to me at first very strange, because I had always imagin'd, that the Hair of the Head and Face did not change or fall off, like that of other Parts of the Body. But I consider'd how much the Skin is softned by warm Water and hard rubbing, and that the Notches in the Razor, which by reason of their smallness escaped the naked Eye, when they meet with such Hairs, are not capable of Cutting off the Hair, but rather tear it out by the Root; which also may be the Cause of the Pain or Smart that one feels, when one is shav'd with an indifferent Razor. I view'd some of those little Hairs that had the Roots on, and observed the sides of them to be a little Tore or Mangled; which I suppose might be occasion'd by the Notch of the Razor, that had laid hold of the Hair in that Part, and so pull'd it out.

I have moreover busy'd my self in observing the Muscles of the Cod-fish, and observed that none of the small Particles, that compose the said Muscles, were thicker than the single Hair of a Man's Chin; but they were of several sizes, some of them being not half so big as others. When the Parts of the Fish were dry, I cut some of these Muscles across with a Razor, which I set and prepared after the manner mention'd in my former Letter; and I observed in some of those Muscles so cut, as many small Streaks as there were Notches (invisible indeed to the naked Eye) in the aforesaid Razor, insomuch that we who observ'd it were amazed at

it. And as every Particle of the Muscle of the aforesaid Fish is composed, as I have formerly observed, of an unspeakable number of long slender Particles, so every little Notch of the Razor, did not only make a little Sreak in the Muscle, to which it was apply'd, but also caus'd such a Roughness in it, that one might discover the exceeding slender Particles, of which one of the long Particles, no thicker than a course Hair, is composed: Notwithstanding that the small long Particles, dry'd up so quick, that one shou'd have taken them for a solid Body.

For my further satisfaction, I sent a clean Towel to a Burgher of this Place, who being about Fifty Years old, had grey Hairs on his Chin, intreating him that when he was next Shav'd, he wou'd let his Barber wipe the Razor upon the said Towel.

Having view'd some of these Hairs thro' my Microscope, I discover'd the Streaks that the Razor had made therein, as plainly as those which I mentioned before of my own, although the said Burgher told me, that he had not been shaved in a long time so softly and easily as then.

I observed in the said Hair a great many little ones whose Roots were compleat; and amongst a great many of them of different Figures, I observed one Hair that had three sides with roundish Angles, and that all the three sides bended inwardly.

I sent another Towel to another Burgher of about Sixty Years, to the end that I might likewise observe his Hairs; in which also I discover'd the little Streaks occasion'd by the Notches of another
Razor,

Razor, but with this Difference, that the Streaks in the last Hair were finer than the former, which I only attribute to the last Razor's being set upon a better Hone: Among these Hairs also I found some that had their compleat Roots. I shall conclude here, and remain,

Honoured Sir,

Delft, Nov. 22:
1709.

Your most Humble Servant,

Antony van Leeuwenhoek.

A N
I N D E X
T O T H E
Twenty Sixth VOLUME
O F
Philosophical Transactions.

Agriculture. The Manner of Manuring Land by Sea-
Shells. No. 314. p. 59. The Manner of Manu-
ring Land by Sea-Sand. No. 316. p. 142.
Air, the different Densities of it. See *Experiments*.
Amber, its Luminous Quality, No. 314. p. 71.
Animals of the *Philippine Islands*, No. 318. p. 241
Antiquities. Roman Coins found in *Yorkshire*, No. 316.
p. 134. Roman Monuments found there, No. 319,
p. 289. No. 320. p. 314. A Pagan-Temple and un-
known Characters at *Canara* in the *East-Indies*, No. 321.
p. 372. Ancient Brass-Instruments found near *Bram-*

- h.im-Moor* in *Yorkshire*, No. 322. p. 393. A large Dis-
course upon the same, No. 322. p. 393.
Apoplexy, Effects of it on the Brain and Nerves, No. 313.
p. 40.
Attraction, its Laws and Principles, No. 315. p. 97.
Attractive Qualities of several Bodies. See *Experiments*.

B.

- Barometrical Observations* in the Year 1708. No. 321.
p. 342.
Birds, some Account of their Migration, No. 315. p. 123.
Birds kill'd in the hard Frost 1708. No. 324. p. 465.
Blackness of the Face very unusual, in a Girl 16 Years
of Age, No. 323. p. 424.
Blood. See *Circulation*.
Books. See the end of this *Index*.
A *Bullet*, which lay in the Head near 30 Years, No. 320.
p. 317.

C.

- California*, the Discovery of a Passage to it by Land,
with a Discription of the Country, No. 318. p. 232.
A *Callus*, that supplied the Loss of part of the *Os Fe-*
moris, No. 323. p. 451.
A *Child* crying in the Womb, No. 324. p. 485. A Dis-
sertation upon the same, No. 324. p. 487.
Circulation of the Blood in Fishes, &c. No. 319. p. 250.
The manner of observing the *Circulation* of the Blood
in an Eel, No. 323. p. 448.
A *Colliery*, that took Fire and was blown up near *New-*
castle, No. 318. p. 215.
Copper. See *Metals*.
Cornea, Observations upon Incisions of it. No. 322. p. 387.
Coral. See *Microscopical Observations*.

Diamonds,

D.

Diamonds, their Luminous Quality in the Dark, *No.* 314. p. 73. The Figure of their Particles, *No.* 324. p. 479.

E.

Echo's, some Observations upon them, *No.* 313. p. 7.

Eclipse of the Sun Sept. 3. and of the *Moon* Sept. 18. 1708.

No. 320. p. 312.

Electricity of several Bodies. See

Experiments. The different Densities of the *Air* from the greatest natural Heat to the greatest natural Cold, *No.* 315. p. 93. The continuing several Atmospheres of *Air* condensed in the space of one, *No.* 318. p. 217. The Luminous Qualities of *Amber*, *Diamonds*, and *Gum-Lac*, *No.* 314. p. 69. The Attraction of *Threads* included in a *Globe-Glass*, *No.* 315. p. 82. A *Glass Tube* attracts *Leaf-Brass*, *No.* 315. p. 84. &c. The Luminous and Electrical Qualities of *Sealing-Wax*, *No.* 315. p. 87.—of *Sulphur* and *Rosin*. *No.* 315. p. 89. &c. *Sealing-Wax* attracts *Leaf-Brass*, *No.* 315. p. 91. The Light and Electricity of a *Globe-Glass* lined with *Sealing-Wax*, *No.* 318. p. 219.—of a *Globe-Glass* lined with *Pitch*, *No.* 322. p. 391.—of a *Globe-Glass* lined with *Flowers of Sulphur* and common *Sulphur*, *No.* 323. p. 439. Actual *Sound* not propagated thro' a *Vacuum*, *No.* 321. p. 367. The Propagation of *Sound* from the Sonorous Body into the common *Air* in one Direction only, *No.* 321. p. 369. The Propagation of *Sound* thro' *Water*, *No.* 321. p. 371. The Spontaneous *Ascent* of *Water* and other Liquors, in small Tubes, between *Glass Planes*, &c. *No.* 319. p. 258, &c. The different Densities of common *Water* from the greatest Degree of Heat to the freezing Point, observed by the *Thermometer*, *No.* 319. p. 267. The *Freezing* of common *Water* and *Water* purged of *Air*, *No.* 320. p. 302. The *Freezing* of *Water* tinged with a *Liquor* extracted from *Shell-lac* and with *Logwood*, *No.* 320. p. 304. The *Freezing* in *Water Bodies* of the same Species but of unequal Surface, *No.* 320. p. 306. The *Weight* of common *Water* under different Circumstances, *No.* 318. p. 221.

F.

Fœtus's bred out of the Womb, No. 323. p. 426. The Bones of a dead *Fœtus* taken out of the *Uterus* of a Cow, No. 323. p. 450. *Fœtus* crying in the Womb, No. 324. p. 485. *Fracture* of the Skull, No. 317. p. 173. *Frost*, a History of that in the Year 1708-9. N. 324. p. 454. *Freezing*, See *Experiments*.

G.

Gangrene in the Thigh of a Woman 62 years old, No. 313. p. 41. *Glass*, its Electricity, &c. See *Experiments*.

H.

Hair voided by Urine, No. 323. p. 414. Observations upon it by the Microscope, No. 323. p. 416. A further Account of the same, and of several solid Bodies voided by Urine, No. 323. p. 420.

Hydrophobia, A Relation of 3 Cases of it, No. 323. p. 433.

I.

Icy Mountains of *Switzerland* described, No. 320. p. 316. An *Idiot* at *Ostend*, that swallowed several Brass and Iron-Instruments, No. 317. p. 170.

Inundations in *Ireland*, No. 320. p. 309.

Iron. See *Metals*.

Island raised by a *Volcano* in the *Archipelago*, No. 314. p. 67. No. 317. p. 200. New *Philippine-Islands* discover'd. No. 317. p. 189.

| L.

Lead. See *Metals*.

Light producible from several Bodies. See *Experiments*.

Lightning. See *Thunder*.

M.

Mathematicks. *De Linearum Curvarum Longitudine*, No. 314. p. 64. *Leges Attractionis, aliaque Physices Principia*, No. 315. p. 97. *De Legibus Virium Centripetarum*, No. 317. p. 174. *De Natura & Proprietatibus Soni*. No. 319. p. 270.

Manuring of Land. See *Agriculture*.

Medicines, Purging and Vomiting, with a Table of their Doses in particular Ages and Constitutions. No. 314. p. 46.

Metals, Experiments made upon them with the Burning-Glass, No. 322. p. 374. *Mi.*

Microscopical Observations on the Blood-Vessels and Membranes of the Intestines, No. 314. p. 53. On the Tongue, No. 315. p. 111. On Red Coral, No. 316. p. 126. On the white Matter upon the Tongue of Feverish Persons, No. 318. p. 210. On the Circulation of the Blood in Fishes, No. 319. p. 250. On the Palates of Oxen, No. 320. p. 294. On the Particles of Christallized Sugar. No. 323. p. 444. On the Edge of Razors, No. 324. p. 493, &c. On the Configuration of Diamonds, No. 324. p. 479. The manner of Observing the Circulation of the Blood in an Eel by the Microscope, No. 323. p. 448.

Migration of Birds. See Birds.

Monstrous Births, No. 320. p. 310.

Monuments. See Antiquities.

Mountains of Ice. See Icy Mountains.

N.

Northern Streaming, No. 320. p. 310.

P.

Philippine Islands, an Account of some Animals there, No. 318. p. 241. New Philippine-Islands discover'd and described, No. 317. p. 189.

Phosphorus made of Human Dung, No. 314. p. 69.

Pitch, its Light and Electricity. See Experiments.

Q.

Quicksilver. See Metals.

R.

Rain, the Quantity that fell in the Year 1707 and 1708.

N. 321. p. 342.

Razors, the Edge of them observed by the Microscope,

No. 324. p. 493.

Roman Coins and Monuments. See Antiquities.

S.

Scurvy, the strange Effects of it at Paris in the Year 1699.

No. 318. p. 223.

Sound, Experiments and Observations on its Motion, &c.

No. 313. p. 2. The Nature and Properties of Sound,

No. 319. p. 270. See more in Experiments.

Formed

Formed-Stones, a Catalogue of some in the *Ashmolean Museum*, No 314 p. 77.

Storms See *Ibunda*.

Styrax liquida, the manner of making it, No. 313. p. 44.

Sugar, the Figure of its Particles when Crystalliz'd, N. 323. p. 444.

Sulphur. See *Metals and Experiments*.

T.

Thunder and Lightning, which happened in Ireland, Aug. 9. 1707. No. 313. p. 26. At Ipswich, July 16. 1708. N. 316. p. 137. Of the same at Colchester, No. 316. p. 140. In Yorkshirc, Aug. 5. 1708. No. 319. p. 289.

Tin. See *Metals*.

Tongue, Observations made upon it by the Microscope. See *Microscopical Observations*.

Tumour, a very large one on the Thigh, No. 317. p. 172.

V.

Vitrification of Metals. See *Metals*.

W.

Water, its Weigh., different Densities, &c. See *Experiments*.

Winds, their Velocity, No. 313. p. 30. Observations upon the Winds and Weather, in the Years 1707 and 1708. No. 321. p. 342.

B O O K S,

Of which some Account is given in this Volume of Transactions

Praelectiones Chymicae Oxoniae habita a Johanne Friend, M. D. Aedii Christi Alumno, No. 320 p. 319.

An Account of Animal Sacrction, the Quantity of Blood in the Humane Body, and Muscular Motion By James Keill, M. D. No 320 p. 324.

OYPERIΦOITHΣ Helveticus, *sive Itinera Alpina Trium*, &c. Authore Joh. Ja. Scheuchzero, M. D. No 316. p. 143:

L O N D O N :

Printed for H. Clements, at the Half-Moon in St. Paul's Church-Yard. 1710.

